ELECTRICAL REVIEW

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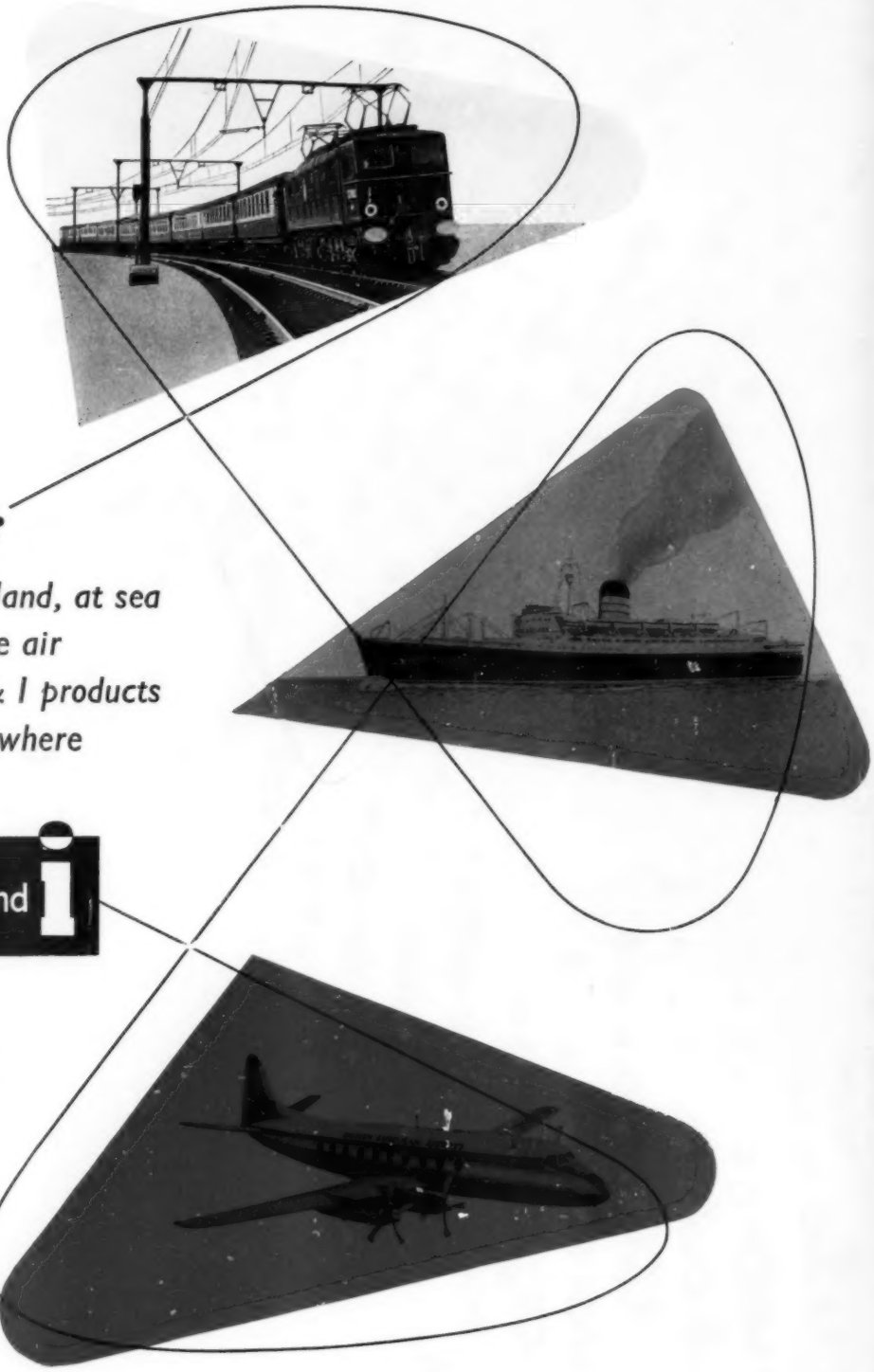

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P1254 One of several Switchboards supplied for big new Lancashire School. This switchboard comprises back-of-board type switches, fuses and contactors with front-of-board operation.

P1256 Illustration shows main switchboard controlling power and lighting at Manchester College of Science and Technology. Switches are of 25 MVA rupturing capacity, tested to BS.116 at 400 volts. Duplicate bus bars are provided with front-of-board operated changeover switches for changing over between the College's own Turbo Alternator set and Electricity Board.

P1263 Switchboard illustrated below is one of several supplied recently to control the power and lighting of the Chemistry & Engineering Building, Queen's University, Belfast, the two incoming units and bus bar coupler being 1600 amp. capacity.

P1263

Consulting Engineers for Queen's University, Belfast:— Oscar Faber & Partners.

P1256

Architects for the recent extensions to the Manchester College of Science & Technology were Bradshaw, Gass & Hope of Bolton, who were also responsible for the design of the engineering services.

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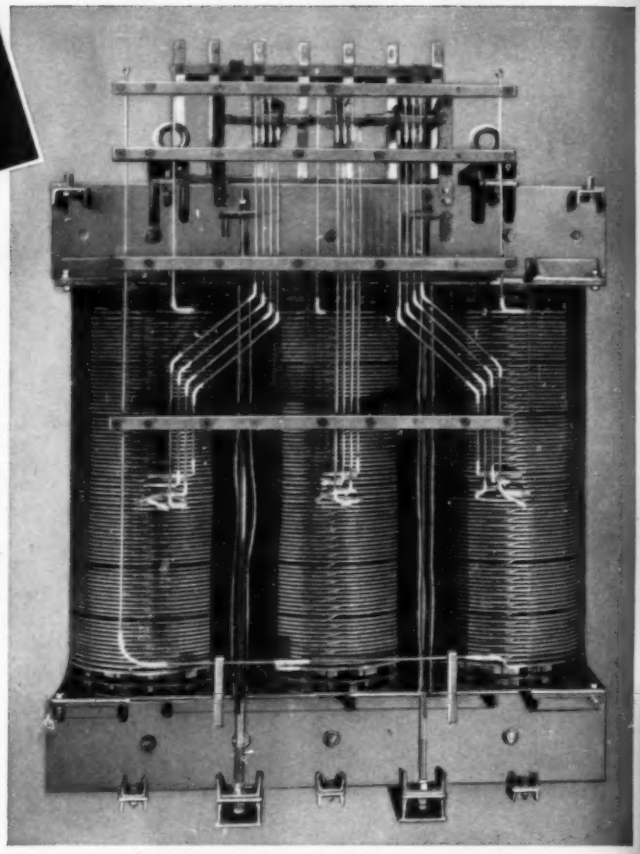

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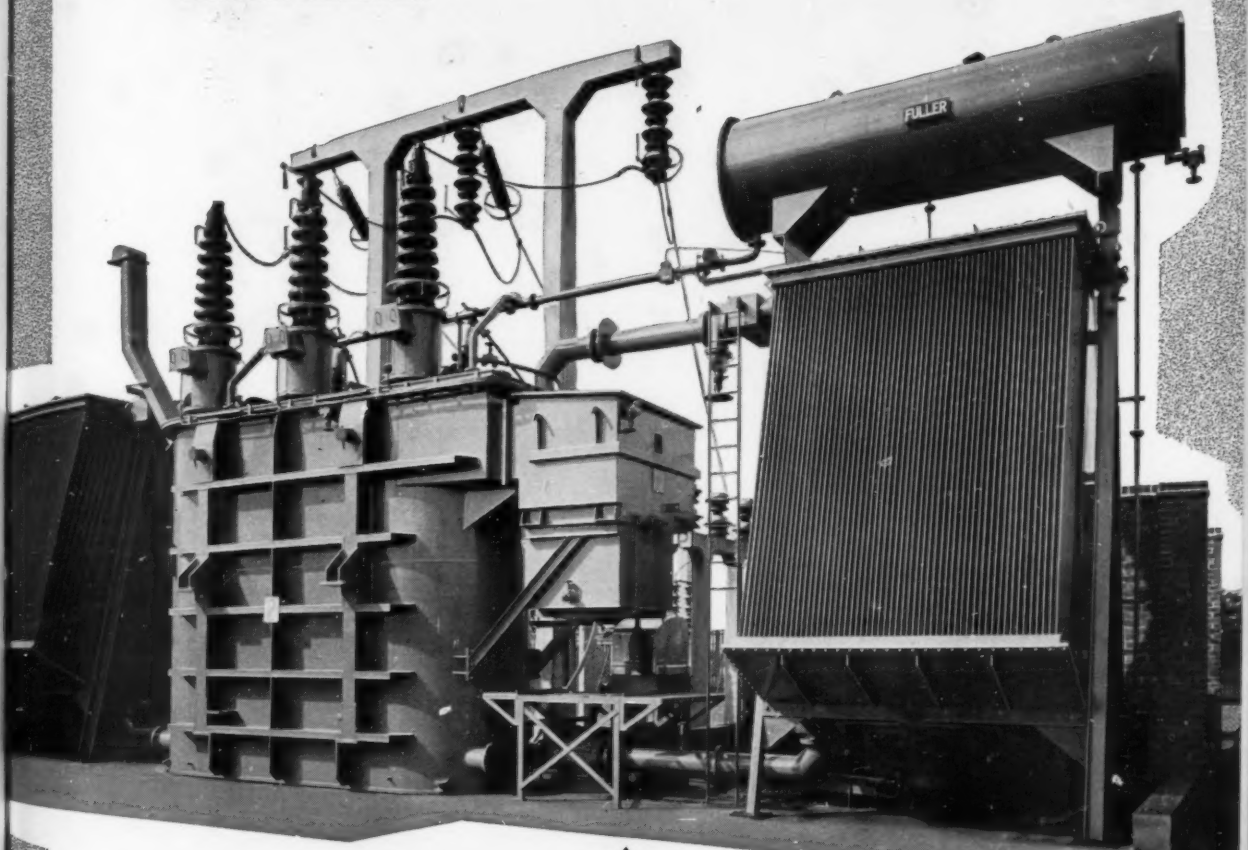

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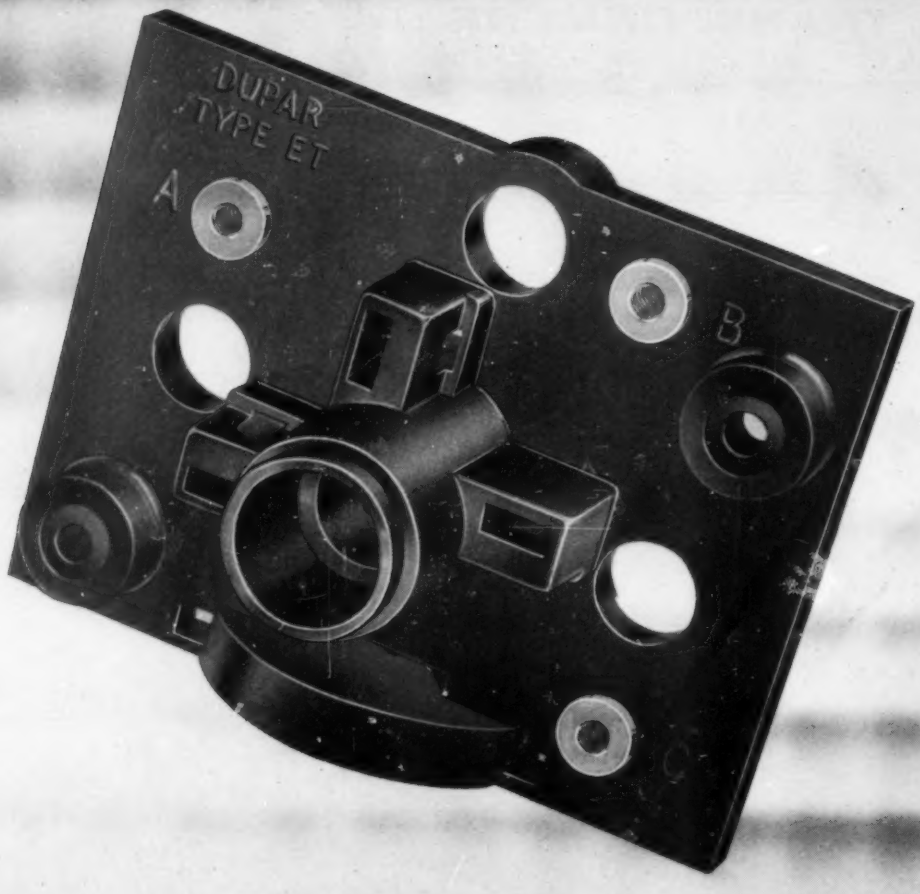

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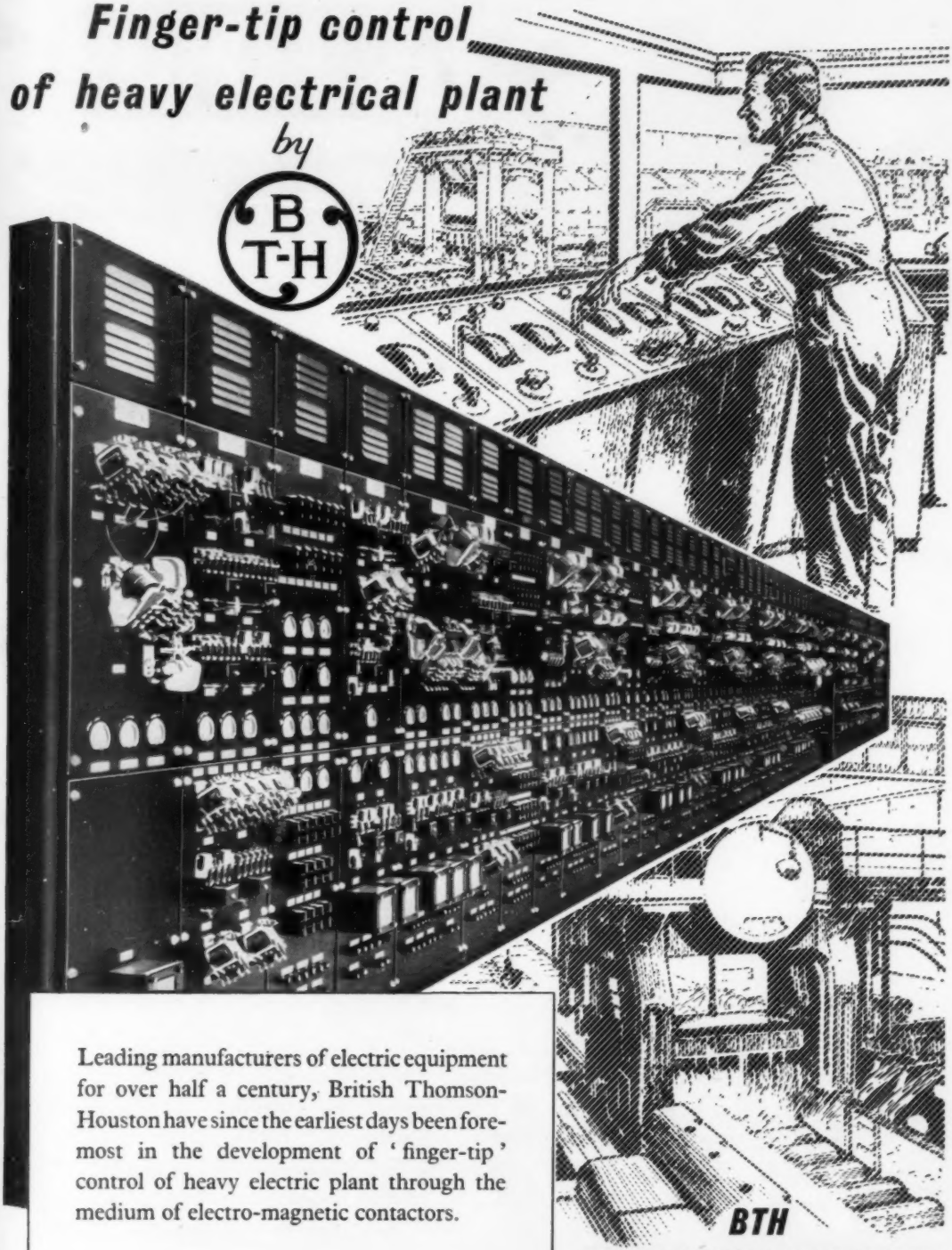

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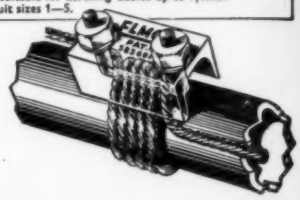

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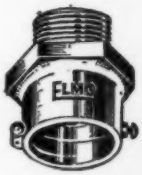

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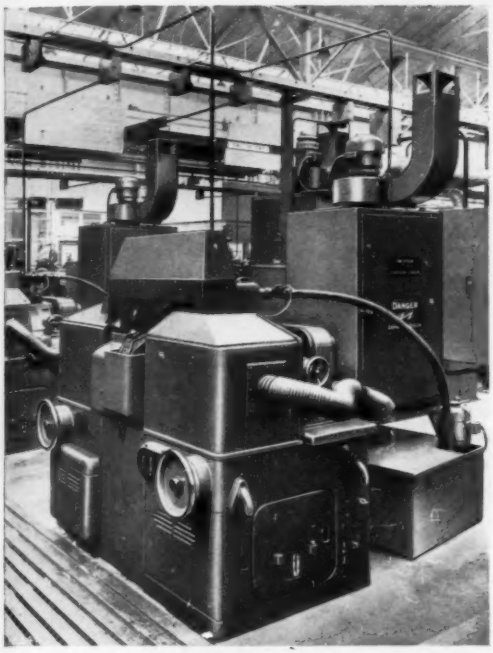

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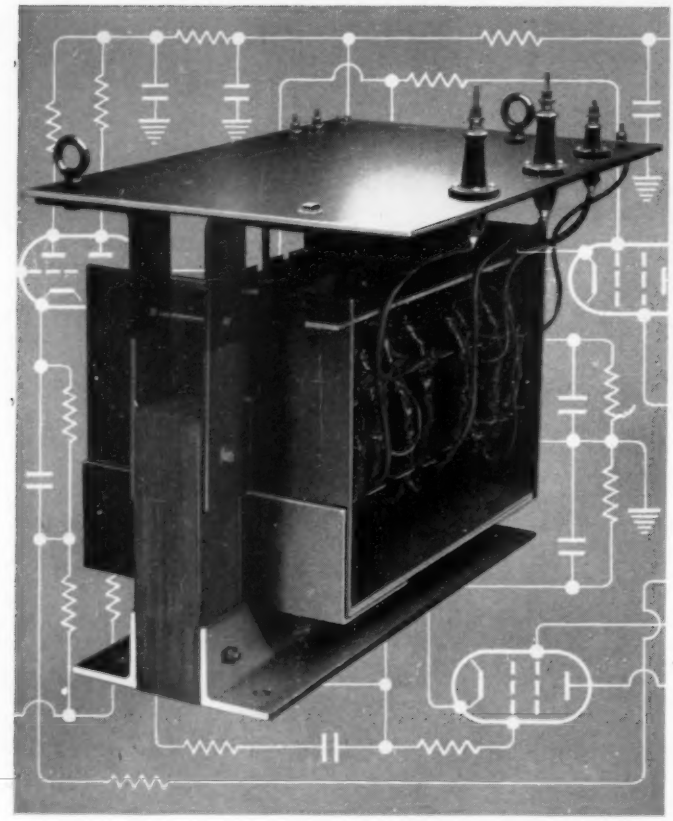
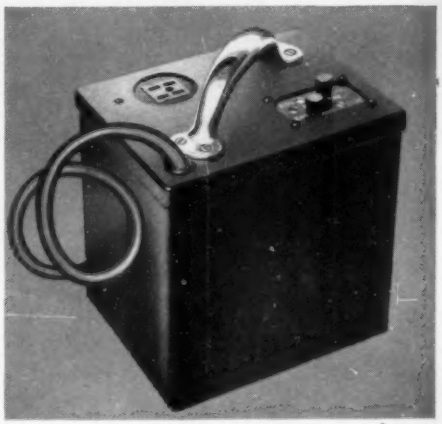
Equally important is the individual attention given to all enquiries and orders regardless of size; and we make a point of keeping our delivery promises.





The special instrument on the left, far from orthodox in many ways, is just over two feet long and gives 250 watts at 2,500, 5,000 or 10,000 volts at frequencies between 400 c/s to 10,000 c/s.

And above, in contrast, is a simple isolating transformer for use where portable power supply is required, such as for hand tools, sub-standard film projectors, lighting etc., or for stepping mains voltage up or down.

Your requirements may call for instruments very different from these examples. Please take advantage of our experience, knowledge and constructional skill in the production of all types of transformers.

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TP/59

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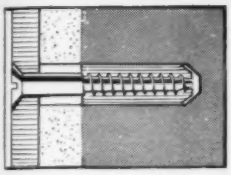
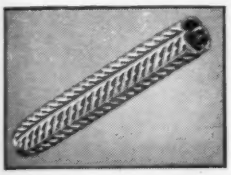
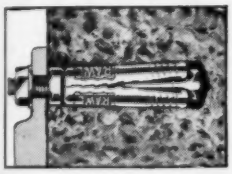


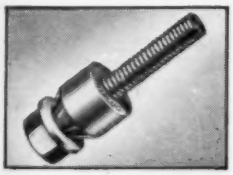
For firm Screw Fixings. The specially treated fibrous construction of the Rawlplug provides the most effective stronghold for wood-screws in any masonry. The simple method of making the hole, inserting the Rawlplug and driving home the screw enables firm fixings to be made quickly without mess or damage to walls or decorations. Sizes are from the tiny No. 3 to the 1″ diameter No. 30.



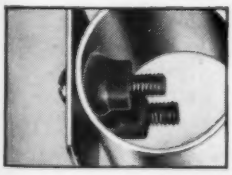
On the occasions where a metal plug is preferred or advised, such as for wet or acid situations, there is the choice of Rawlplug Screw Anchors or White Bronze Plugs, but for these Cadmium plated screws should be used.



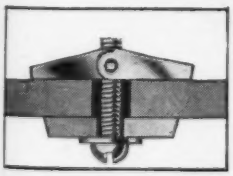
Heavy Duty Fixings. RAWLBOLTS are expansion bolts which only require a hole in the masonry in the same way as a Rawlplug. By turning the bolt the metal segments are locked within the hole and the fixing will take very heavy loads with complete safety. Sizes are from 3/16″ to 1″ diameter.



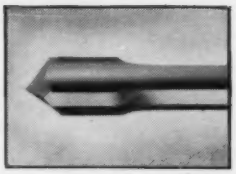
Wet or Acid Situations. Rawlplug Bolt Anchors and Rawltamps are made for heavy duty bolt fixings in places where the exposure to corrosion is extremely high. The Bolt Anchor can be set deep down in thick concrete whereas the Rawltamp enables a threaded insert to be fixed in shallow concrete.



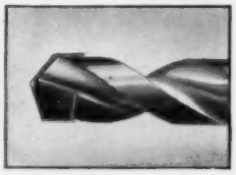
Thin or Cavity Walls. Proprietary building materials often present fixing problems because of being either hard and thin or thick and soft. The Rawlplug Company have devised several clever devices for making firm fixings to such materials including lath and plaster ceilings, hollow pot, panel doors, etc.
The upper illustration shows how one of the devices will make the almost impossible fixing of a metal plate to a pipe and the bottom illustration shows how the wings of a Spring Toggle spread the load over a plasterboard ceiling.



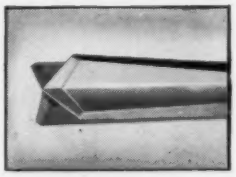
Rawldrills. Standard sizes for Rawlplugs Nos. 3 to 30 and Rawlbolts A. B. C. D. E. and G. Adaptable Rawldrills need only three holders for the 10 sizes Nos. 3 to 22. There is also a very useful Universal Tool-set with a knurled holder to take Universal Rawldrills Nos. 6 to 20.



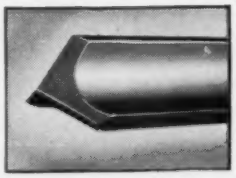
Durium tipped Drills. For faster, silent penetration of masonry and tiles Durium drills are the answer. They can be used in hand or suitable electric drills. Sizes for Rawlplugs Nos. 6 to 30; for C. D. E. and G. Rawlbolts, and a long series for drilling right through walls. Free resharpening Voucher given with every Durium drill.



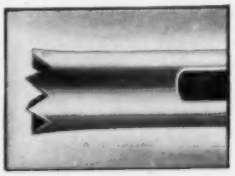
Rawlplug Stardrills. An inexpensive one piece tool for use on jobs needing a small number of holes. Twenty sizes from 11/32″ to 2½″ are made, of which eight are for Rawlbolts "A" to "K", and it is only necessary to quote the reference letters of the Rawlbolts when ordering Stardrills to use with them.



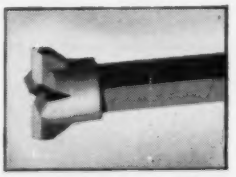
Wall Boring Tools. Specially designed for rapid boring right through walls. This triple fluted percussion tool with hexagon handle in one complete unit has been proved to make a ½″ hole right through a 9″ stock brick wall in nine minutes. Lengths 18″ and 24″, diameters from 5/16″ to 1½″.



Tubular Boring Tools. Will bore a clean hole in soft brick wall quicker than any other hand percussion tool. The serrated edges saw through masonry and the dust is collected in the channel and ejected through the elongated slot. When working in deep holes the tool should be withdrawn periodically and the dust tapped out. Sizes are from ¼″ to 1″ diameter.



Power Tools. In addition to the hand tools listed above special Rawlplug tools are made for use in electric and pneumatic power tools. Details of these can be had on application.



Rawlplug Fixing Devices and Hole Boring Tools are sold by Ironmongers' Hardware Dealers, Builders' Merchants and Stores. If you experience any difficulty in obtaining the type and size you require please send details to the following address.

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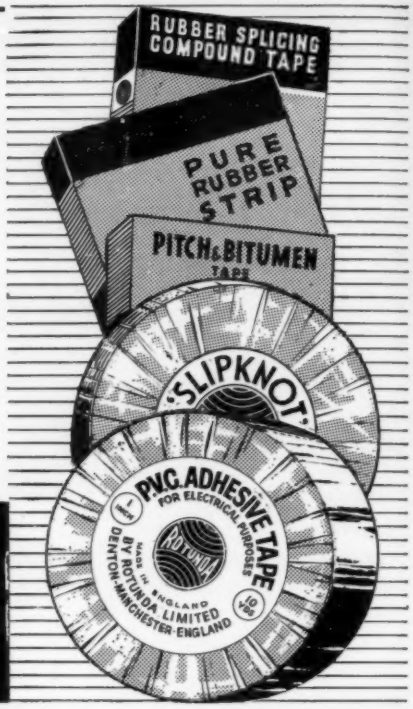

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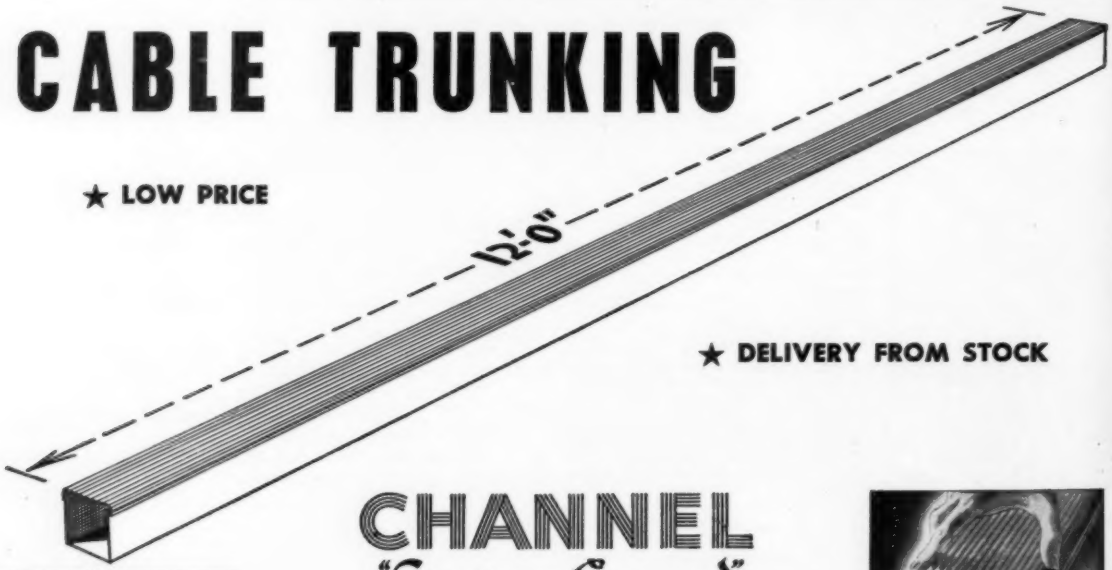

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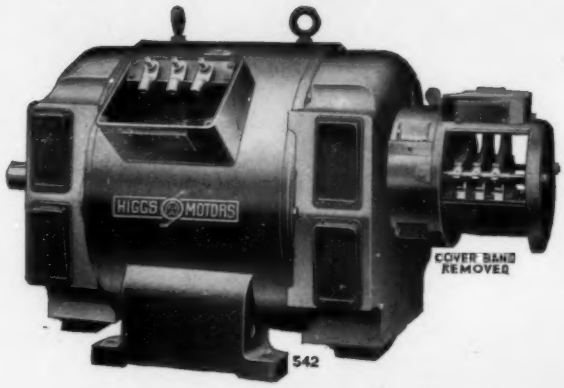

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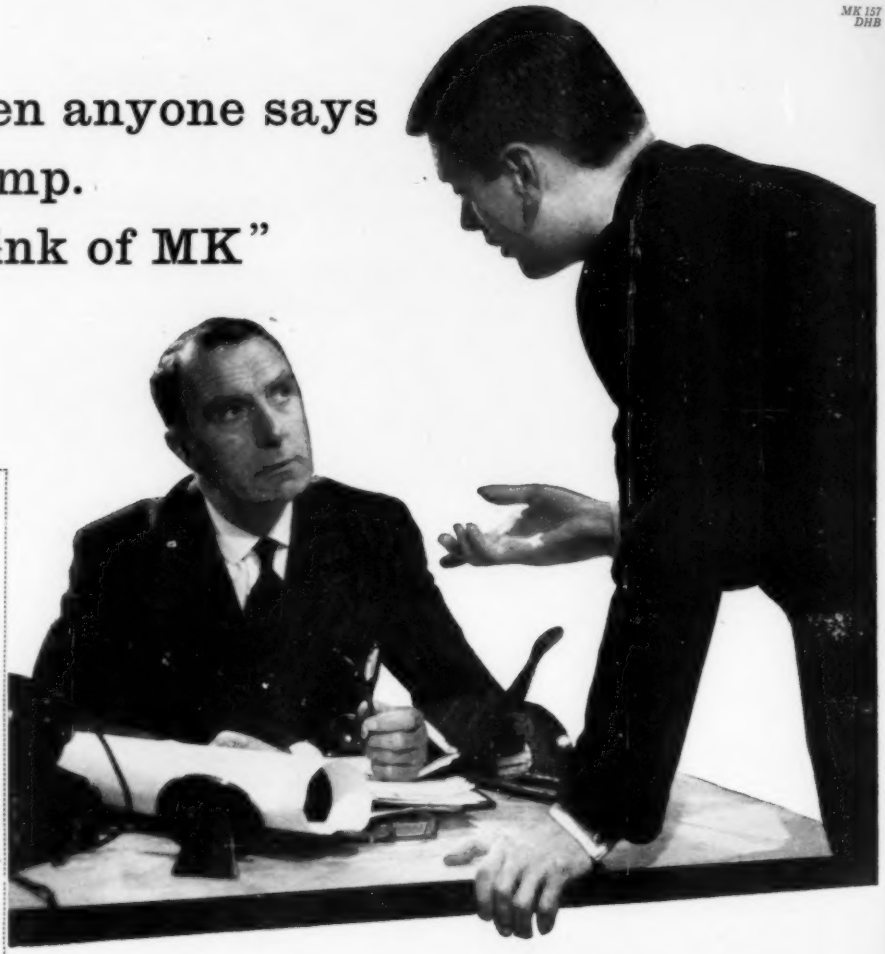

List No. 656 Fused-switchplug

List No. 646 Fused-plug

List No. 732 Flush brass socket-outlet

List No. 2457 Flush insulated pilot-lamp switchsocket-outlet

LOOK at any single design detail—it's a real engineering job. Automatic adjustment of contact pressure and alignment prevent any risk of overheating. The design of the shutter action—an original MK patent—produces a smooth snap-action when the plug is inserted. And the cost of installation is cut down by such features as automatic double earthing, well positioned terminals, and the generous machine-cut terminal screws. The range is comprehensive, and all the flush designs, including the pilot-lamp switch-socket-outlets, fit into the same standard box. The styling of every accessory is simple and unobtrusive.

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50 ,, ,, ,,	5 ,, A.C. & D.C.
100 ,, ,, ,,	10 ,, ,, ,,
500 ,, ,, ,,	50 ,, ,, ,,
1 A ,, ,,	100 ,, ,, ,,
5 ,, ,, ,,	200 ,, ,, ,,
10 ,, ,, ,,	400 ,, ,, ,,
	500 ,, ,, ,,
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10,000 ohms, 100,000 ,, } using internal 1½ volt cell
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POWER AND DECIBELS

Impedance	Power	Decibels 0=50 mW
500 ohms	200 mW	—25 to + 6
5,000 ohms	2W	—15 to + 16
50,000 ohms	200 mW	—25 to + 6

Various accessories are available for extending the wide range of measurements.

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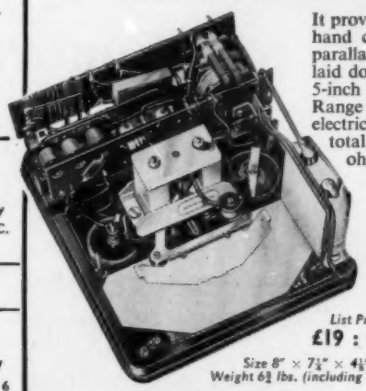
THE wide scope of this multi-range AC/DC measuring instrument, coupled with its unfailing reliability, simplicity of use and high degree of accuracy, renders it invaluable wherever electrical equipment has to be maintained in constant, trouble-free operation.



It provides 50 ranges of readings on a 5-inch hand calibrated scale fitted with an anti-parallax mirror. Accuracy is within the limits laid down in Section 6 of B.S.S. 89/1954 for 5-inch scale industrial portable instruments. Range selection is effected by means of two electrically interlocked rotary switches. The total resistance of the meter is 500,000 ohms.

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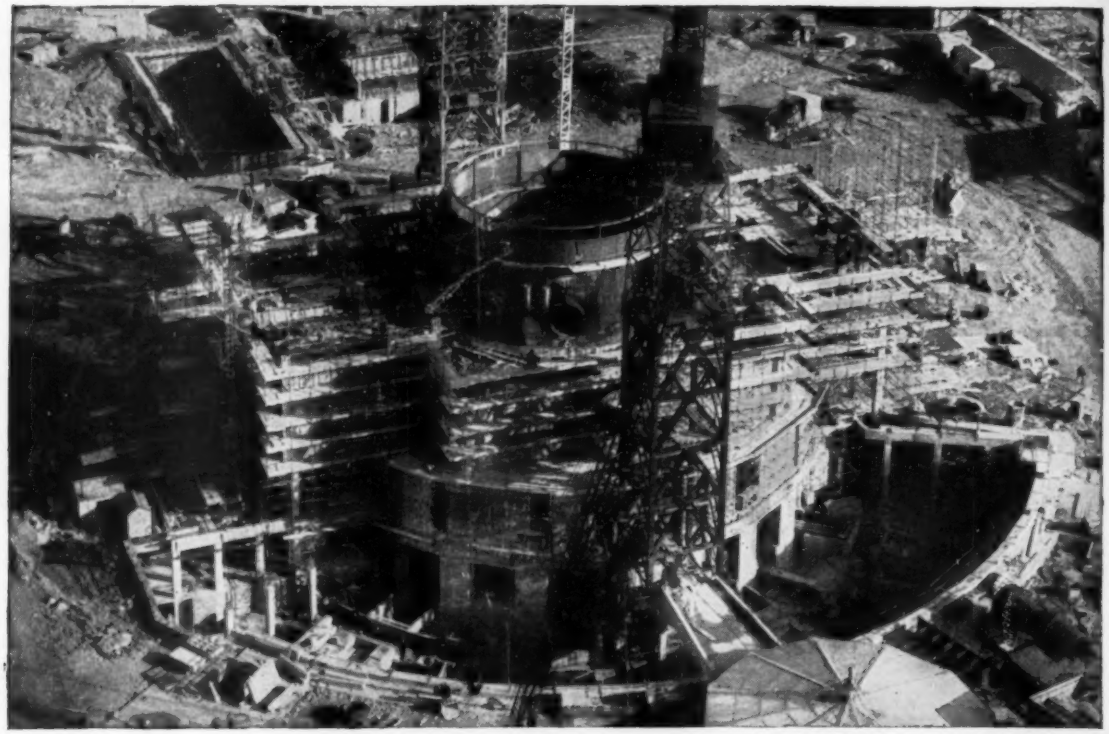

Nuclear Power Station under construction at Berkeley, Gloucestershire.

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OUR COUNTRY'S ECONOMY depends on electricity; more electric power will bring higher production in the factories, greater comfort and pleasure in our everyday lives. As our economy expands, so does the need for power, and at the present rate it doubles every ten years.

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Not all electricity will be generated by nuclear power, however, and 'conventional' generating stations will continue to be needed. The Central Electricity Generating Board has recently placed contracts for the largest 3,000 r.p.m. turbo-alternator and associated unit boiler in the world—a 550,000 kilowatt unit for the projected new station at Thorpe Marsh. Another projected new station—Blythe 'B'—will be equipped with 275,000 kilowatt in-line units; these, too, are the biggest of their kind yet designed.

Though these are projects which will not be completed for some time, the work of the Central Electricity Generating Board is playing an important part in today's fight against inflation. Power stations are being built now at an overall cost no greater than in 1948 — £50 per kilowatt installed. And though the output capacity of the power stations has doubled since 1948, the increase in manpower is only about one-third.

* * *

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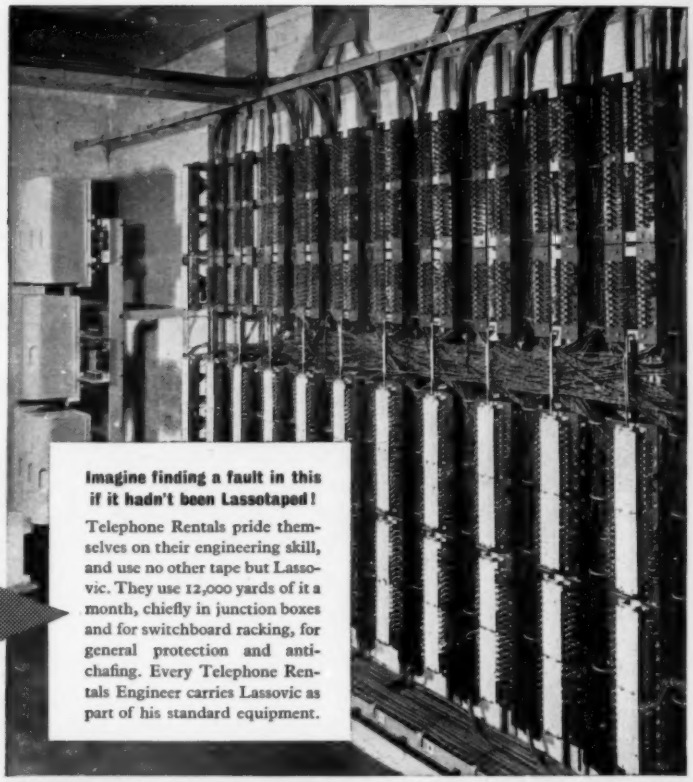

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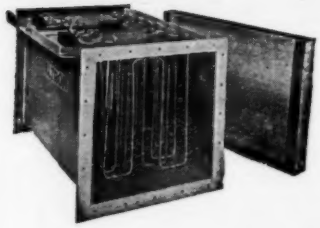

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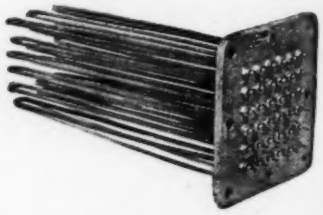

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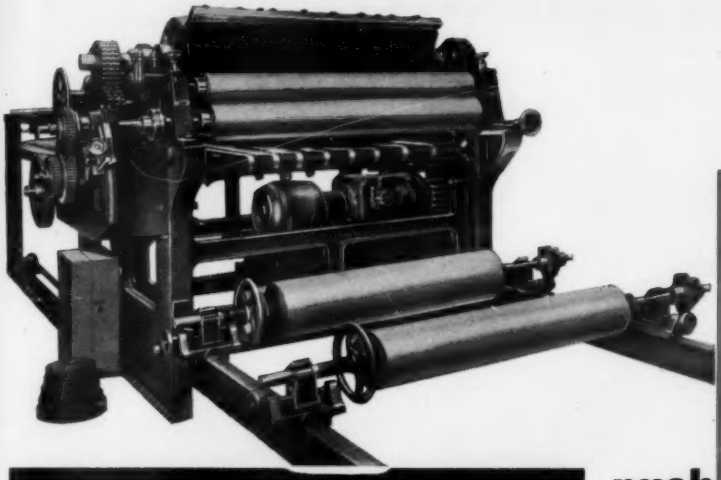

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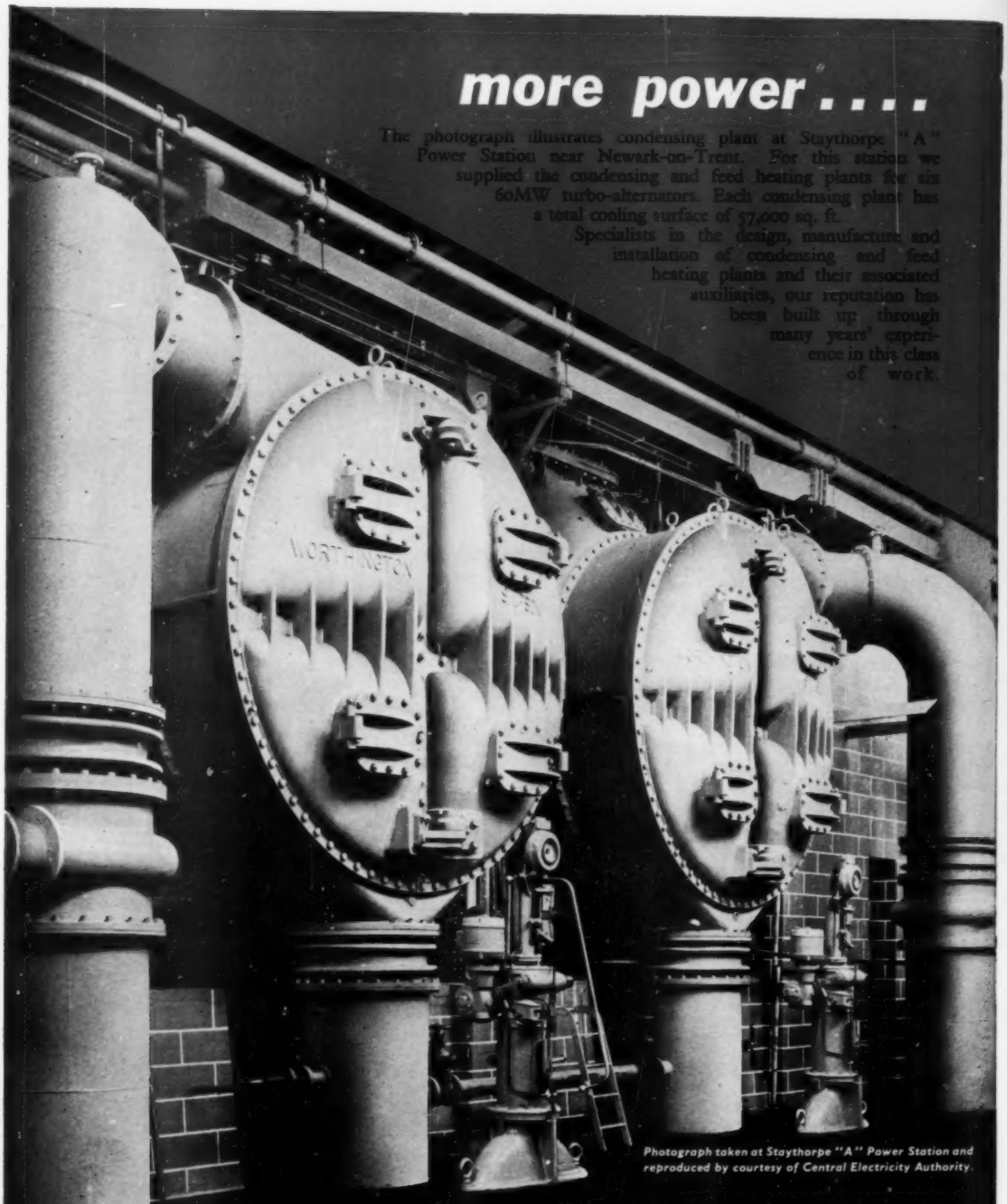

Photograph taken at Staythorpe "A" Power Station and reproduced by courtesy of Central Electricity Authority.

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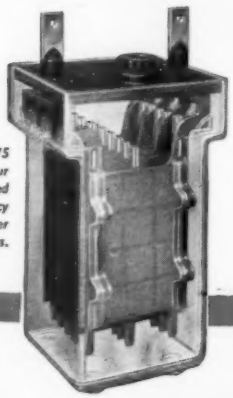

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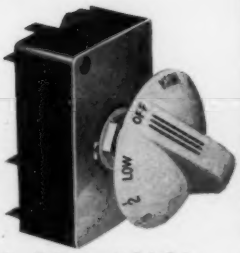
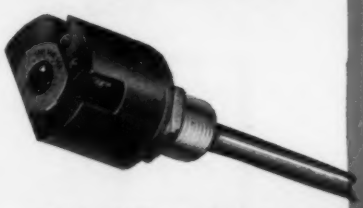


Satchwell Superswitch infinite control for boiling plates



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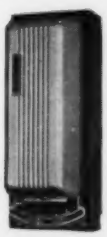

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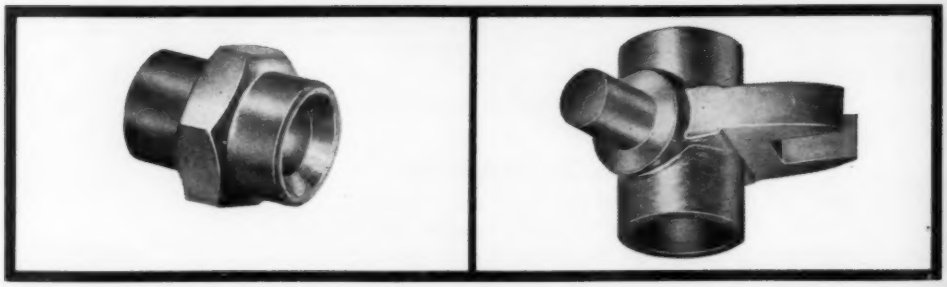

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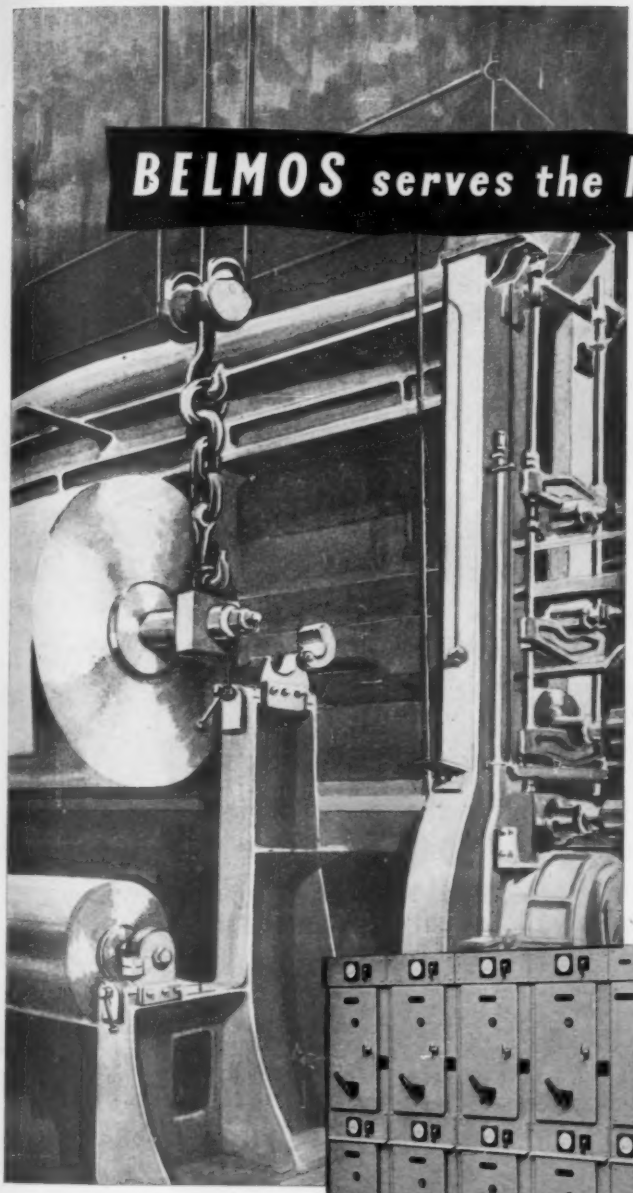

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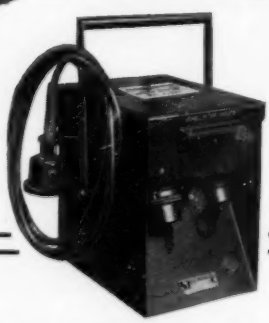
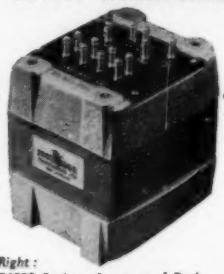
INDUSTRIAL TRANSFORMER UNITS

Illustrated above is a Partridge E.H.T. Testing Transformer, and right, a recent Partridge development, a portable, water-proof, Low Voltage Transformer Unit of 1 kVA rating. This new unit is most suitable for use on quays, etc. where water is liable to splash and use of low voltage tools is essential.



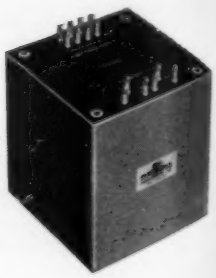
The Partridge range of Industrial Transformer Units covers most normal replacement types, and includes Power Transformers, single or multiphase, up to 25 kVA, and a full range of Low Voltage units for safe operation of hand tools, etc.

HIGH FIDELITY OUTPUT TRANSFORMERS



Left: P5000 Series. Available for a matched range of high fidelity output and power transformers of superior performance.

Right: P6000 Series. A range of Push-Pull Output Transformers of 100 watts Power Rating for use in equipment reproducing the full audio frequency range with lowest distortion.



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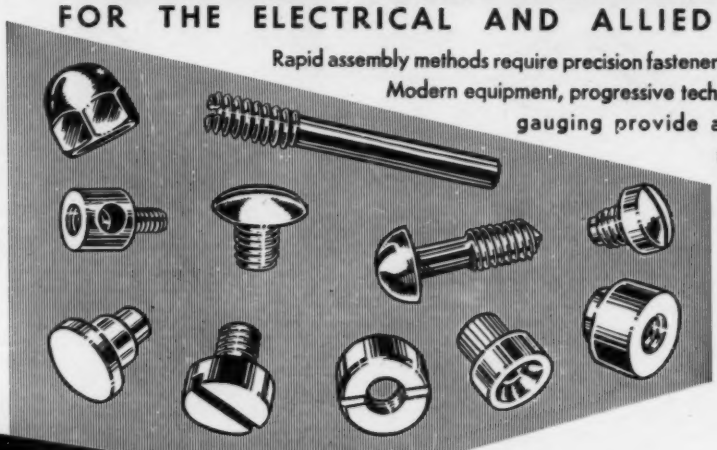

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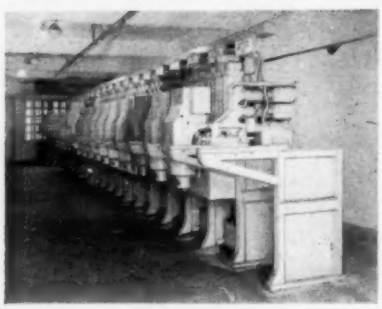

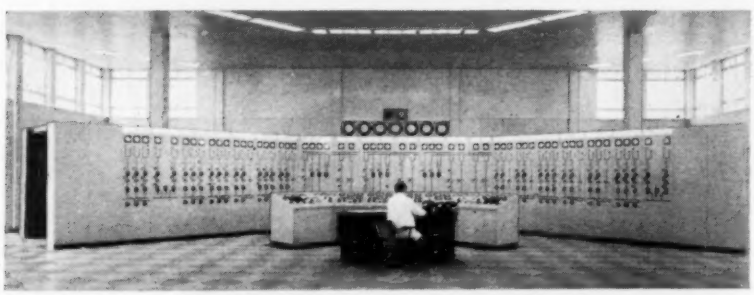

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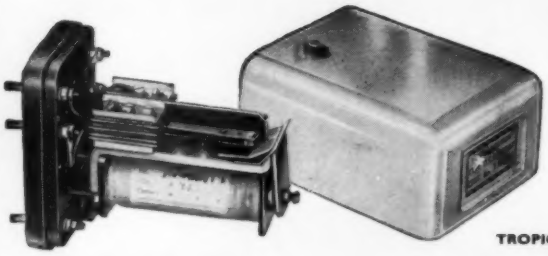

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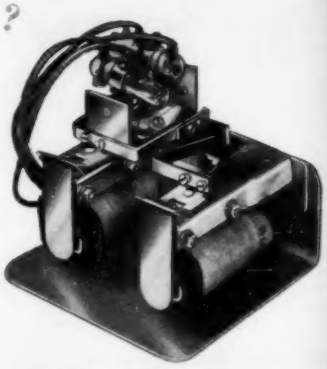

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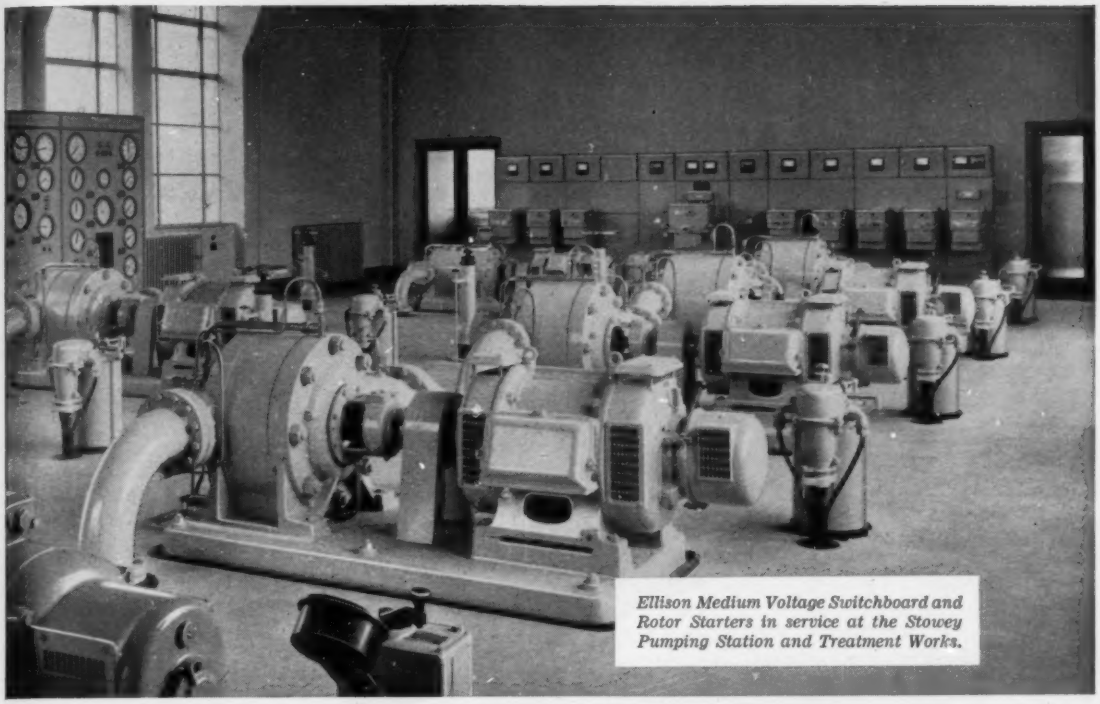

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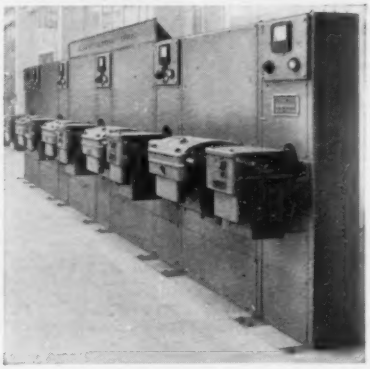

An Ellison Medium Voltage Korndorffer Starter Switchboard in service at the Chew Stoke Pumping Station.

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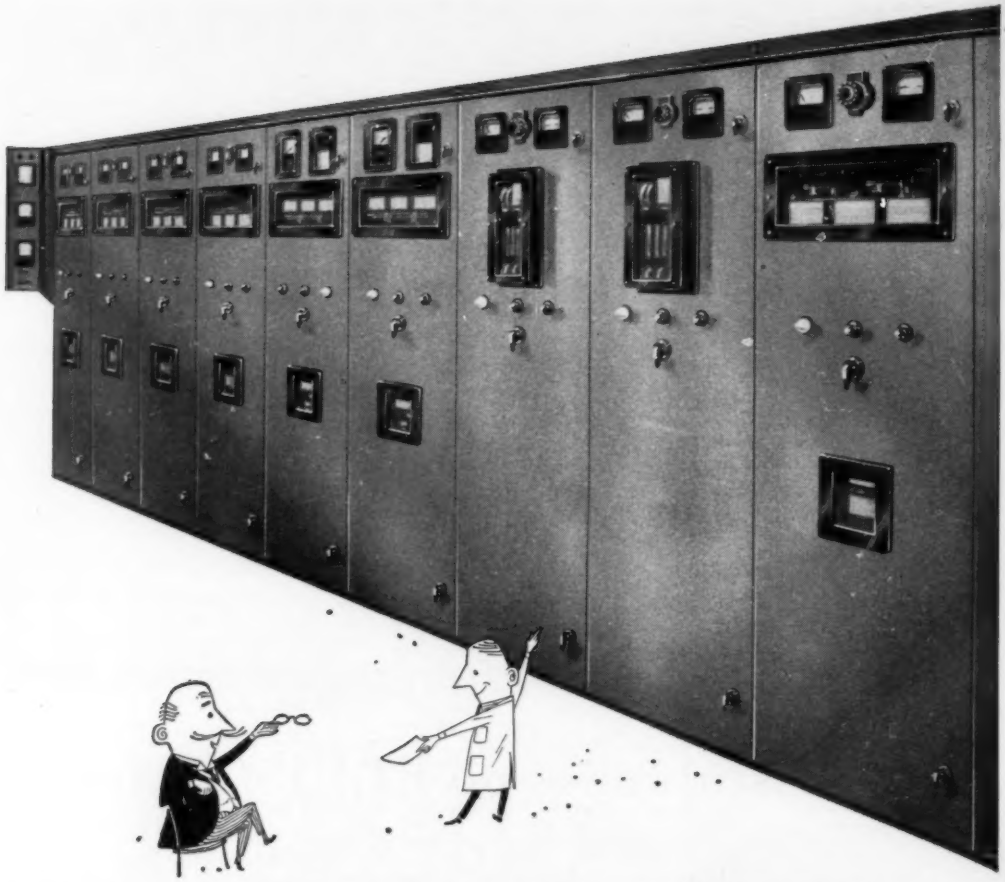

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ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

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Work on different types of nuclear reactor systems is being carried out by the U.K.A.E.A. to determine the most economical means of power production from nuclear energy in the future

Research in Welding 189
Arc welding has assumed great importance in modern industry and to gain the maximum possible benefit from this method of joining metals there is a demand for ever greater welding speeds combined with higher metallurgical quality. To meet this demand the welding industry conducts a continuous programme of research. A comprehensive survey of this work and its applications is made by the author

Report on Atomic Energy 194
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The distinction should be drawn between the first 1,160 h.p. diesel-electric main-line locomotive built by British Railways under the railway modernisation programme, and some of the smaller motor coaches which have been put on the railways fairly recently, apparently for main-line work

✧ ✧ ✧ ✧

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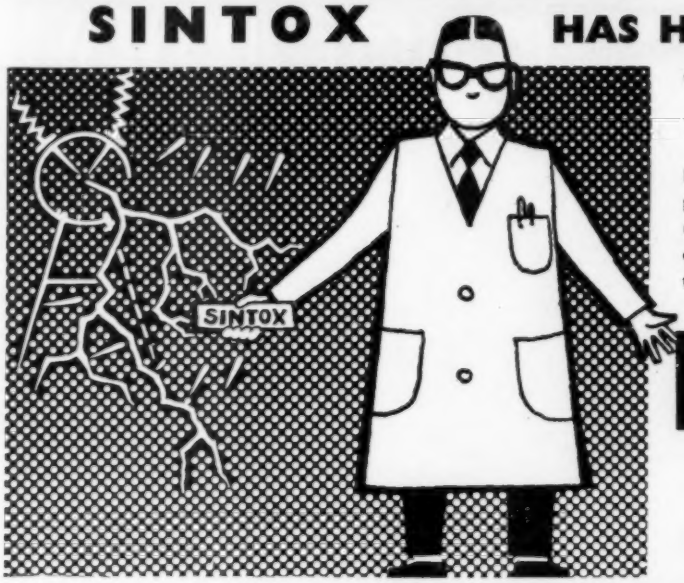

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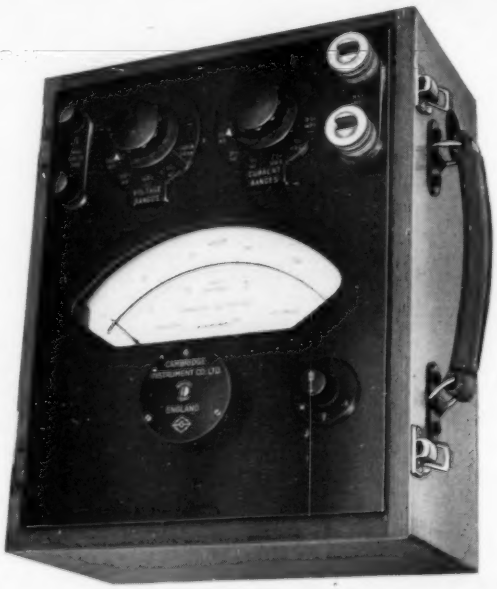

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ELECTRICAL REVIEW

1 August 1958 Vol. 163 No. 5 Established 1872

Nuclear Power Progress

FURTHER development of the gas-cooled graphite-moderated reactor will be the primary objective of the United Kingdom Atomic Energy Authority during the 1960's, it is stated in the Fourth Annual Report of the Authority which we summarise in this issue (page 194). The gas-cooled reactor system which has proved itself at Calder Hall and is the basis of the designs of the four civil nuclear power stations now being constructed, is capable of still further development. Higher temperatures can be achieved by replacing the uranium metal by a ceramic compound (e.g. uranium-oxide) and by the use of different canning material (e.g. beryllium). This type of advanced gas-cooled reactor (A.G.R.) would operate at a temperature intermediate between the improved Calder Hall type and the high-temperature, gas-cooled reactor system. The best alternative system may be the heavy-water moderated reactor and if a satisfactory design can be evolved, the first commercial station might be commissioned in the late 1960's.

By the following decade work on the fast-breeder reactor system may have reached the stage at which commercial power stations can be built. Research in this field will be carried out at Dounreay while experimental data have already been obtained at Harwell in ZEPHYR and ZEUS. The high-temperature gas-cooled reactor (H.T.G.R.) may be another system for possible use in the 1970's and this is being investigated at Winfrith Heath.

So far as thermo-nuclear reactions are concerned, it is not yet possible to suggest when power from this source will be available. The original zero-energy apparatus, ZETA, is now being modified and should be operating in a few months as ZETA 1A. In a second modified form, ZETA 1B, it is hoped to attain 10 million deg C early next year. A second toroidal experimental machine, ZETA 2, has been designed and the break-even temperature may be reached with this apparatus.

Even though work on the completion of the fast-breeder reactor at Dounreay has been slowed down, it is quite clear from the report that Britain is still in the forefront in the nuclear power field and the Authority is not content to develop only the Calder Hall type of reactor. Any and every means of economically obtaining power from nuclear energy is being thoroughly investigated, including thermo-nuclear fusion. A nuclear marine propulsion reactor is also receiving attention with a view to developing a unit to operate a steam turbine which would be economically competitive with an oil-fired prime mover.

With the emphasis on research and development, the present nuclear power programme is not being neglected by the Authority. Co-operation with the industrial consortia has been maintained as well as the training of their personnel at Harwell and Calder Hall.

OPPORTUNITIES IN CANADA

Much of what the Dollar Exports Council delegation to Canada has to say in its report is not new but it is nevertheless worth repeating. Canada is a land of great and expanding opportunity for British manufacturers. Her population, which is now 17 million, is expected to rise to around 75 million within the lifetime of many children now in their nurseries. It has also been estimated that the value of Canada's imports, at present over $5,000 million, will have more than doubled by 1966.

Existing facilities for helping British firms who wish to enter the Canadian market either on their own or in association with other firms have been improved and extended, and the delegation has made a useful suggestion for ensuring that Canadian and American designers are fully informed of sources of supply of engineering products in Britain. The visit of the delegation, coupled with that of the Canadian Trade Mission to this country last year and the desire of Canadians to reduce their adverse trade balance with the United States, has produced a favourable climate of opinion towards greater imports from Britain. The exploitation of this situation and future success in the Canadian market now depends on the enterprise and energy of individual manufacturers.

The electrical industry, and particularly the heavy plant branch, has done well in Canada, which is now the industry's fourth largest market. But even so we should not be satisfied. In 1956 total Canadian imports of electrical equipment amounted to £106·2 million; of this £90 million came from the United States and only £12·7 million from Great Britain. That is a measure of the scope for expansion.

EUROPEAN FREE TRADE

Fears that negotiations for the establishment of a European Free Trade Area being conducted by a Ministerial Committee of the Organisation for European Economic Co-operation would be abortive were dispelled last week when concessions by the French made it possible to decide to continue the discussions in October.

Although many British industrialists are still fearful of the effects of European Free Trade, most of them now realise that the exclusion of this country from any trade and tariff arrangements come to by the rest of the European countries would be even more harmful to their interests. It is therefore essential that the negotiations shall result in some form of agreement.

RAILWAY MODERNISATION

We publish in this issue (page 213) a report of our recent inspection of the first main-line diesel-electric locomotive to be erected in British Railways workshops under the British Transport Commission railway modernisation scheme. It should be emphasised that it is the first to be erected in British Railways workshops because we have already published accounts of several diesel-electric locomotives which have been built by various manufacturers during the last few years. Surely these cover such distances as to qualify them for the term " main-line locomotives." The last example, we think, was the introduction of diesel-electric trains on the London to Hastings route of the Southern Region, although in this case motor coaches rather than locomotives were referred to and in any case the driving unit appears to be very much lower than the 1,160 h.p. of the engines of the locomotives which we are now describing. The main point is that this latest development is another step to all-out electrification and we think that modernisation will not have its full meaning until we can express it as full electrification.

WAITING FOR THE CHANCELLOR

Purchase tax is a troublesome impost in many (some would say all) respects. Not the least of its ill effects is that when there is a possibility of a change in rates retailers are prone to delay purchases from manufacturers and wholesalers. Before every Budget there is a diminution of orders, creating a " valley " in the production curve and at the moment there seems to be a fear that there may be an autumn Budget and possible further reductions in purchase tax.

Whether there will be an interim Budget or not is quite uncertain (we cannot see the necessity for it) and in any event purchase tax alterations are not tied to the Budget. The Chancellor of the Exchequer can make changes by means of an Order in Council at any time and in fact this has been done on previous occasions. It would be of advantage to industry, particularly the domestic appliance branch, if purchase tax alterations were entirely dissociated from the Budget.

ARC WELDING INFLUENCE

In his article on " Research in Welding " in this issue (page 189), Mr. P. L. J. Leder shows how profound the influence of arc welding on industry has been throughout the world. The introduction of arc welding offers not only a faster and cheaper method of fabrication but also less weight and more reliability in the finished product. Many of the younger industries could not have been developed in their present form without the use of arc welding. The stringent requirements for pressure vessels used in nuclear reactors could probably not be met by any other process than arc welding. The cost in time and money of constructing oil pipelines and storage facilities by any method other than arc welding would be prohibitive.

But Mr. Leder's article does much more than point to these fundamentals, important as they are. The very many processes involved in arc welding are discussed largely from the point of view of the research worker and the importance of the power sources is stressed.

BLANKETS AND PADS

Next week's issue will contain an illustrated survey of the range of electric blankets and pads now available for domestic use. Besides size and price, the details to be given will include method of control, loading, material and colour

Special attention is paid by the author to the three basic methods of automatic arc welding—the continuous covered-electrode, submerged arc and gas-shielded processes. He emphasises the continued importance of manual welding in many applications. Something is also said about welding appliances and power supply equipment.

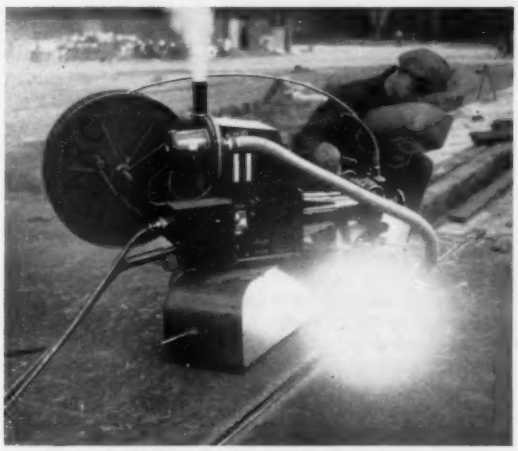
Research in Welding

By P. L. J. LEDER, M.Sc., F.I.M.*

Broad Survey of Recent Investigations

THE importance of arc welding in modern industry can scarcely be over-estimated. In industries where riveting and other methods of joining metal had held the field for years, the introduction of arc welding offered not only a faster and cheaper method of fabrication, but also less weight and more reliability in the finished product; the instances of shipbuilding and of pressure-vessel manufacture spring to mind. Where younger industries are concerned, it is doubtful if many of them could have been developed at all in thei present form without the use of arc welding. The necessarily stringent specifications for pressure vessels used in nuclear reactors could probably not be met by any other process, and the cost in time and money of constructing oil pipelines and storage facilities by any of the older methods would be prohibitive.

It is not only in these large and impressive undertakings, however, that the advantages of welding are apparent. The progress brought about in other industries may be less spectacular, but it is none the less real and important. As industries develop, they present new and challenging problems, while in order to gain the maximum possible benefit from welding, existing users are now demanding ever greater welding speeds combined with ever higher metallurgical quality. To meet this demand the welding industry has had to engage in research activity on a large scale.



A carriage-propelled automatic welding head for the continuous covered-electrode process, at work in a shipyard

Arc welding can be carried out either manually or automatically. The scope for expansion of the automatic processes is still vast: for example, in this country over 90 per cent of all arc welded steel fabrications are produced by the manual covered-electrode process. One of the major fields of research in the sphere of automatic welding is the application of existing processes to industries where only manual welding has been used in the past. Nevertheless, mechanisation can never completely oust the manual welder; it is very seldom possible to use an automatic process completely alone, and there are many applications where it seems unlikely that manual welding will ever be replaced.

Materials and Processes

The electrodes used in manual arc welding almost always consist of a length of wire on to which a flux covering is extruded as a paste and then dried. The covering melts in the heat of the arc.

The flux covering has several functions, and is designed to affect the physical properties and chemical reactions of the molten weld metal and slag. The profile of the weld bead, for example, is controlled by the surface tension acting at the metal-to-slag interface and also by the melting point of the slag. These considerations are particularly important in electrodes designed for welding in the vertical and overhead positions. The slag floats on top of the weld metal, giving a considerable degree of protection from atmospheric contamination.

On the chemical side, the flux covering may carry a number of constituents. De-oxidising and alloying elements may be added to the weld metal by means of the covering, and many electrodes (notably the low-hydrogen types mentioned below) generate a shield of CO_2 in the region of the arc, which is of great importance in protecting the weld metal from the atmosphere. Certain minerals are also added to stabilise the arc. In electrodes for welding special steels, it is generally cheaper to add the de-oxidisers and alloying elements through the covering, than to use a special core wire containing these materials.

In automatic welding there are basically three processes: visible-arc with continuous covered-electrode; submerged-arc; and gas-shielded.

Automatic Continuous Covered-Electrode Process.—In this process the continuous electrode is fed into the weld

* Director of Research, Quasi-Arc, Ltd.

pool by a welding head which also supplies the welding current to the electrode.

The core wire of the electrode is surrounded by two layers of helically opposed auxiliary wires, in contact with the core wire and with each other. The covering paste is extruded into the spaces between these wires, and the outer wire projects slightly above the level of the paste, to form an electrical contact for welding current supply. The paste fulfils the same functions as in manual welding.

Submerged-Arc Automatic Process.—In this process a bare wire electrode is deposited under an overburden of pre-fused and granulated flux powder which is fed from a hopper to the weld area. Excellent control of the weld profile and finish is obtained and atmospheric contamination is negligible, but the addition of alloying elements is more difficult; it is sometimes necessary to have special wires containing additional elements, or to use a continuous covered electrode in conjunction with the flux powder, for special purposes.

Gas-Shielded Processes.—In these processes a bare wire electrode is deposited in a shielding atmosphere of gas, supplied usually from cylinders mounted with the welding equipment. An essential characteristic of the bare wire gas-shielded process is the use of thin wires at high current densities; the spray type of metal transfer produced gives an arc which is self-adjusting in length and leads to a very high rate of metal deposition. No flux is used and there is therefore no slag.

These processes have found their principal applications in the welding of non-ferrous metals, especially light alloys, and also stainless steels. They are less attractive for ferritic steels owing to the general high quality and low cost of welds made in these materials by the other welding processes. Electrode wire for welding ferritic steels in the absence of flux must contain special de-oxidising additions and this causes a higher price differential between such wire and ordinary core wire for covered-electrode welding than is the case for non-ferrous alloys. However, in certain suitable applications where a high operation factor can be maintained, the continuous operation, high deposition rate and absence of slag removal costs enable the bare wire gas-shielded processes to compete economically with other processes for the welding of ferritic steel.

Both the gas-shielded and submerged-arc processes can be used in semi-automatic form.

Manual Covered-Electrode Welding

The persistent popularity of manual welding is due primarily to its simplicity and low initial cost, and to continuing work to improve electrodes and plant.

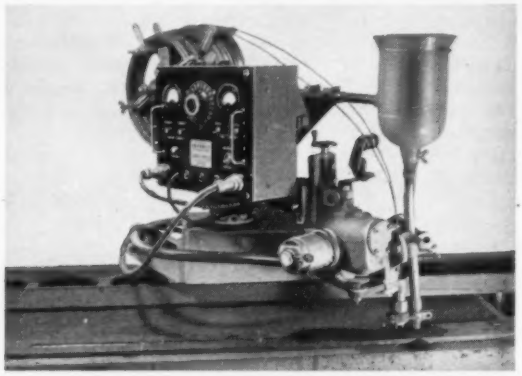
The operational behaviour of electrodes is receiving much attention, and great improvements have been made in such factors as arc stability, touch-welding properties, bead profile and slag detachability. The last two features are of particular interest to those concerned with the economic aspects of welding, since they affect electrode consumption and the proportion of the welder's time during which his arc is actually burning.

On the metallurgical side, all new electrodes are expected to show a high radiographic standard of deposit soundness, and to provide weld metal as free as possible from micro-fissuring under a wide range of stress and thermal conditions during welding. The range of electrode types available is steadily growing as continuous research develops new coverings for the welding of special metals; creep- and scale-resisting and other high-tensile steels may now be relatively easily welded, and electrodes have been produced for welding a wide range of non-ferrous metals, for hard-surfacing and cladding, and for many other purposes.

Because the process is so simple, developments in manual welding are unlikely to be spectacular, but two current trends are worthy of note.

The first is the further development and widening application of electrodes with a low-hydrogen basic-type covering. This has many advantages; in brief they are the ability to weld hardenable steels without cracking; the production of sound, fissure-free deposits having excellent mechanical properties; and some subsidiary advantages such as marked tolerance to high-sulphur or segregated steels, normally considered difficult to weld. Basic coverings are being increasingly used for alloy steel and hard-surfacing applications because of their considerable metallurgical advantages, and are essential for high-tensile steels in the 40 to 70 ton U.T.S. range.

Fully-mechanised machine with two welding heads for simultaneously welding the two circumferential seams joining the two domes to an automobile rear axle case



A carriage-propelled submerged-arc welding head arranged for two-wire welding

The second current development of particular interest is the introduction of electrodes having a high proportion of iron powder in the covering. Higher metal recovery rates and faster deposition are achieved by this means; using iron powder electrodes with a rutile-based covering, welding costs can be cut by 40 per cent. The rutile base is notable for the good operating characteristics which it imparts to the electrode.

Other iron powder types are produced; in particular, one recently developed electrode has a rutile-based covering but deposits low-hydrogen weld metal, thus combining the advantages of the two principal types of covering.

Automatic Welding

Considerable advances have been made in all three of the major automatic processes; particularly important are the modifications which incorporate the advantages of two of them within a single process.

Continuous Covered-Electrode Visible-Arc Process.—This process accounts for nearly half the fully automatic welding of steel practised in Great Britain. Its principal advantages compared with submerged-arc welding are the visible arc and its greater metallurgical flexibility, which allows a wider range of materials to be welded and enables electrodes with greater tolerance to rust, dirt and poor fit-up to be developed.

Considerable developments are being made. New and improved welding heads, both stationary and carriage-propelled, together with a wide range of manipulating gear, are part of the rapid growth towards the concept of a complete mechanised welding installation. This side of the subject is discussed below, under the heading "Efficient Use of Welding Processes," and has been treated in detail by Lucey and Swan.[1]

The most outstanding metallurgical advance in the visible-arc process is the use of CO_2 gas shielding with specially designed covered electrodes. This development is discussed under the section headed "Gas-Shielded Processes."

Submerged-Arc Welding.—Fully-automatic submerged-arc welding has been in established use in Great Britain for 24 years. At present it accounts for about 60 per cent of all automatic welding of mild steel.

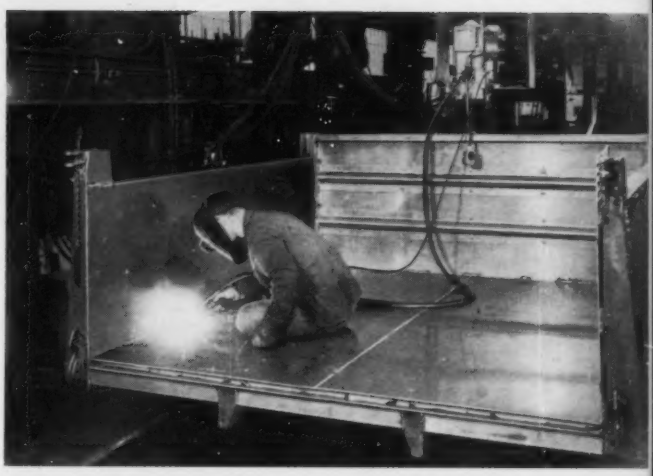
Developments in the process, with new equipment and fully-mechanised welding installations, are taking place with the same rapidity as in continuous covered-electrode welding. There are also extensive developments in techniques and consumable materials.

Developments in techniques are directed mainly towards higher welding speeds by the simultaneous use of two or more electrodes operating in the same weld pool. In Great Britain and the U.S.A. most experience has been with two electrodes, but it is reported that in Russia as many as six electrodes have been used.[2]

There are three essentially different techniques:—

(1) "Parallel welding," in which two electrodes are connected in parallel to the same power supply. This offers an increase in welding speed of about 50 per cent compared with a single electrode.

(2) "Multi-power welding" with two electrodes involves the use of two welding heads, each with its own arc-control system. A number of different multi-power combinations may be employed. A common arrangement is to supply one electrode (usually the leading one) with d.c., and the other with a.c. Alternatively, both electrodes may be supplied with a.c., in which case it is advantageous to use two Scott-connected transformers giving a two-phase output and imposing a balanced load on the mains. A d.c. supply to both electrodes is rarely, if ever, used, since this arrangement leads to considerable interference between the arcs.



Semi-automatic argon-shielded welding of aluminium truck body. The welder holds a light water-cooled pistol, and welding is continuous

(3) "Series-arc welding" employs two separate welding heads with the electrodes connected in series across the poles of a single a.c. or d.c. power supply. The arc is thus formed between the two electrodes, and not between the electrodes and the workpiece. This arrangement results in shallow penetration over a relatively wide area, and consequently it has particular application to hard-surfacing and metal-cladding operations.

Gas-Shielded Processes.—The application of the gas-shielded processes (usually employing the inert gas argon) completely transformed the technical and economical aspects of welding aluminium and its alloys. The processes have been extended with advantage to other non-ferrous metals and to austenitic steels. In addition to speed and economy the processes also have subsidiary advantages, e.g. the high current densities which are used with these processes, which make possible a spray-type metal transfer in the arc instead of the globular transfer usually found in the other processes; this results in very little loss of molten metal by spatter, and gives a very good weld finish, despite the absence of flux.

It was therefore a logical step to extend the process to mild steel, but although this is now satisfactorily established for a number of applications, mild steel presented two factors, not previously encountered, which operated against the immediate success of the process. The first was the formation of marked porosity by chemical reaction in the weld pool, despite complete shielding, and the second was the reduction of economic gain to marginal proportions owing to the low cost of welding steel by other processes.

The porosity is caused mainly by reaction in the weld pool between dissolved carbon and oxygen. It is reduced by using a wire with a low carbon content, and by adding to the wire de-oxidising elements such as silicon, aluminium and titanium.

Using these improved wires, excellent welds can be produced. Nevertheless, this process offers no advance in metallurgical quality over others, and its advantage must be sought in its faster welding speeds. These become apparent only in work where a high duty cycle can be maintained.

In these circumstances there has been a natural interest

in the replacement of argon by a cheaper shielding gas, and a logical choice was carbon dioxide. The tendency to oxidation is greater than with argon, but the wires used to-day have a sufficient excess of de-oxidising elements to cope with the changed conditions. The main effects of CO_2, in fact, are operational and not metallurgical. The CO_2-shielded arc is less stable, it produces considerably more spatter than the argon-shielded arc, and a very short arc-length is necessary for reasonable welding conditions. The shortest arc-lengths produce narrow penetration and badly shaped deposits, and the best compromise that can be made still leaves considerable spatter. The spatter results in higher finishing costs and more frequent stops for cleaning nozzles. It is thus probable that the operational limitations will offset the saving in gas costs, which amount to about 20 per cent of the total cost per lb of weld metal, and that the real saving will be less.

The flux-covered electrode processes, despite their well-established advantages, have certain limitations which become marked at high currents. The best metallurgical properties are provided by low-hydrogen basic-covered electrodes which, however, have only moderate operational performance. The best operational features are obtained from the rutile fluxes, but these are accompanied by lower metallurgical quality. This quality, furthermore, deteriorates at higher welding currents. With manual covered electrodes, satisfactory compromises can be made, but the disadvantages of both groups are accentuated at the current densities employed in automatic welding. The submerged-arc process can be criticised mainly on the grounds of loss of arc visibility, and the inconveniences of dispensing and reclaiming the loose granular flux.

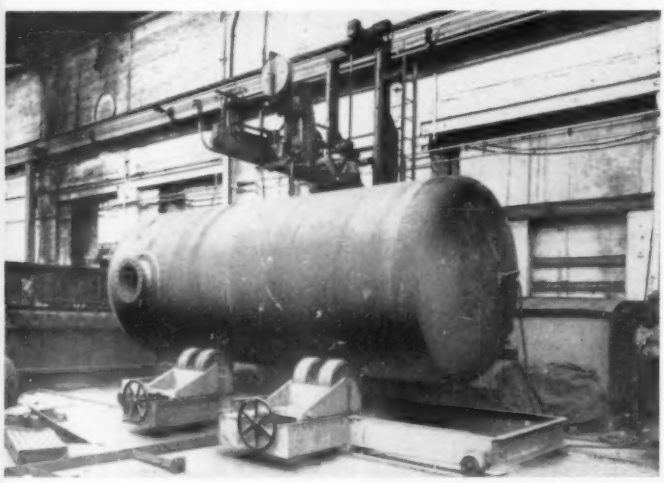
The foregoing considerations point to the case for an automatic process in which the best features of both flux and gas shielding are combined.

Combination of Flux and Gas Shielding

A recently-introduced process of this type has been described by Mitchell and Freeth.[3] It employs a continuous-covered electrode, with a flux designed to operate in conjunction with CO_2 shielding. This shield, in addition to providing efficient protection from the atmosphere, also serves to reduce the partial pressure of hydrogen in the arc atmosphere, and hence reduces the solution of hydrogen in the weld metal. With the metallurgical aspect covered largely by the gas shield, the flux is designed primarily to secure the desired operational characteristics and necessary de-oxidation control.

The metal deposited is of high quality, with all the characteristics associated with low-hydrogen electrodes—i.e. an excellent combination of strength and ductility, freedom from fissures, and first-class radiographic soundness.

Both metallurgical and deposition properties of the electrode are retained at currents considerably greater than those normally used with continuous electrodes that operate in air, and for this reason the process shows considerable economic advantages.



A roller-bed and cantilever installation for welding large cylindrical vessels

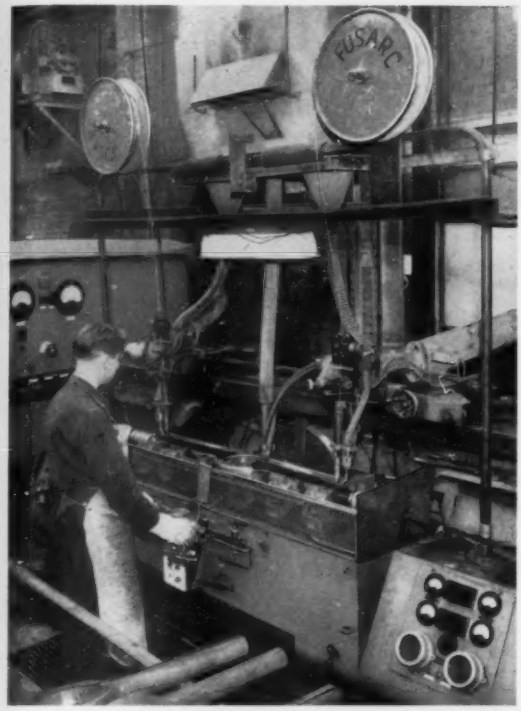
Efficient Use of Welding Processes

The research work which is applied to developing new processes and improving existing ones would be wasted if these processes could not be applied in the most advantageous manner. The installation of an automatic welding machine means that more welded work is going to be turned out; this, in turn, means that materials must be transported quickly and efficiently to the welding head, and finished goods removed equally quickly. While work is actually being welded, it must be manipulated in such a manner that the welding head moves at the correct speed in relation to the joint. Since it is frequently necessary to use manual welding on certain parts of workpieces, measures must often be taken to ensure that the output of the manual welders can keep pace with that of the automatic installation.

To meet these needs, a large amount of design work is applied to the development of equipment for manipulating the workpiece or the welding head. This equipment ranges from small tilting turntable manipulators and positioners for manual welding, to large roller-bed installations capable of supporting and turning cylindrical vessels several hundred tons in weight. A very recent development is a welding head mounted at the end of a long boom, for welding the inside seams of narrow pipes. A closed-circuit television system, with a camera at the welding head, enables the operator to watch the progress of the weld from a console, and to make any necessary adjustments by remote control. A further modern development is a large gantry installation, spanning a working area 50ft wide or more, for welding stiffeners to bulkhead panels in ship construction, and for similar applications. By comparison with the previous method of using a welding head mounted on a small self-propelled carriage, the gantry machine can more than treble the output of two operators in an eight-hour day.

Another recently-developed device is for simultaneously welding the internal and external circumferential seams of oil storage tanks, some of which are as much as 200ft in diameter. Two welding heads are mounted on a saddle-type carriage which straddles the top strake, or ring of plates, as the circular tank is built up. As the carriage moves round, the two seams are continuously welded at the same time.

The combination of new welding processes with highly developed manipulating equipment is enabling something approaching automation to be applied in some fields, particularly in the mass-production industries. In the works of one prominent motor manufacturer a machine can be seen which takes the two halves of a back axle, automatically locates and clamps them, and then welds the two longitudinal seams simultaneously at 70in per min. The casing then rotates, the welding heads return to the starting position, still automatically, and proceed to weld the opposite pair of seams.



Completely automatic installation for welding the longitudinal seams of automobile rear axle casings

Developments of this kind are symptomatic of the general trend towards looking upon welding—particularly automatic welding—as a production tool which must be integrated into the production line if it is to be used with maximum efficiency.

Power Sources for Welding

The inherent simplicity of a.c. power supply equipment for welding, which enables it to be produced at low cost, is one of the main reasons for the development of the wide range of very satisfactory electrodes for a.c. welding which exists to-day. In this country welding current for most normal manual applications is supplied by simple transformers, giving open-circuit voltages usually in the region 80-100, with maximum current outputs ranging from 175 to 600 A. Current control is usually effected by means of a tapped series reactor; stepless current control by means of a series saturable reactor has been tried, but it has been found that distortions of waveform at low currents give unstable welding conditions unless a large amount of iron is used in the reactor. The resulting high cost of this type of control has therefore precluded its general use.

Where a.c. supply is required for automatic welding, transformer and reactor ratings must be appropriately raised; otherwise requirements are similar to those for manual welding, except for multi-power submerged-arc work, where two transformers in Scott connection are often used. Auxiliary services, e.g. current supply for the electrode feed motor, can be obtained from units built into the main power unit.

Some applications of manual welding, and a rather greater proportion of automatic applications, call for a d.c. welding current supply. In the past, this has been obtained from motor-generators when mains supply was available, and from engine-driven generators for site work.

For many years there was relatively little development of d.c. welding generators, partly because the improved arc stability of electrodes designed primarily for a.c. welding applied also to d.c. Owing to the variable nature of the load, and the particular type of load characteristics needed, the requirements for good welding performance are quite different from those of any other type of d.c. generator, and their determination involved long and complicated studies of dynamic characteristics under a variety of welding conditions. The requirements of d.c. generators for manual welding are now better understood, and machines having excellent characteristics are now on the market.

Interest in d.c. power supply equipment has also been accentuated by the increasing amount of automatic welding being done. The search for greater efficiency has led to the introduction of a new type of power source —the transformer-rectifier set, which has a number of advantages over the motor-generator. For example, the rectifier set has substantially higher efficiency, requires less maintenance, has lower no-load losses, is lighter in weight, silent in operation, and less subject to changes in output due to temperature rise. The introduction of this type of welding power source has been a logical development of the transformer used for a.c. welding. It has been made possible by the availability, as a result of intensive development in this field, of reliable lightweight rectifiers capable of carrying high current.

Current control in rectifiers is achieved by means of a moving-core choke or a saturable reactor; the latter has the great advantage that the control is a small variable resistor, which can easily be attached to a wandering lead, giving remote control of the welding current.

More and more firms are now turning to the use of the metal rectifier for d.c. welding current supply. One prominent construction company has seventy-five 375 A rectifiers in use on one site alone; these supply power for manual covered-electrode welding, and can also be readily paralleled to supply power for the inert gas-shielded processes. Rectifiers are also manufactured which are specifically designed for automatic welding and will give currents of 1,000 A and more.

Future Developments

No radical changes in manual covered-electrode welding can be expected in the foreseeable future. There will certainly be a continued improvement in the electrodes which are available, and advances are expected soon in the semi-automatic processes, which will enable continuous manual-controlled welding on workpieces not suitable for fully automatic machines.

In the sphere of automatic welding, new processes will be developed and existing ones improved, but it seems clear that the major advances will be made in the application of these processes. Only through use in conjunction with the correct jigging and manipulating equipment, and through combination with manual or semi-automatic processes at the appropriate points in the manufacturing sequence, can the utilisation of these processes afford maximum efficiency and economy.

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[1] J. A. Lucey and A. H. B. Swan, "Automatic Arc Welding as a Production Tool." British Commonwealth Welding Conference, 1957, pp. 177 to 184.

[2] G. Z. Voloshkevich, Automaticheskaya Svarka, 1955, Vol. 8, pp. 26 to 38.

[3] E. J. Mitchell and W. E. Freeth, "Welding and Metal Fabrication," 1956, Vol. 24, pp. 431 to 438.

REPORT ON ATOMIC ENERGY

Activities of the U.K.A.E.A. in 1957-58

THE fourth annual report* of the United Kingdom Atomic Energy Authority, for the year ended 31st March, 1958, was published last week. It indicates that the principal tasks of the Authority continued to be the fulfilment of defence commitments, research and development on civil applications of nuclear energy, consultancy services to the electricity authorities and collaboration with industry in connection with the nuclear power programme. Substantial progress was made during the year in all these fields.

The year under review saw the commissioning of ZETA (zero energy thermonuclear assembly) in August, the materials-testing reactor PLUTO became critical in October, the zero energy reactor NEPTUNE started to operate in November and the third reactor at Calder Hall became critical in March, 1958. A new radiochemical laboratory was opened at Amersham in November and the first British nuclear weapons in the megaton range were exploded in the Pacific in March, 1957.

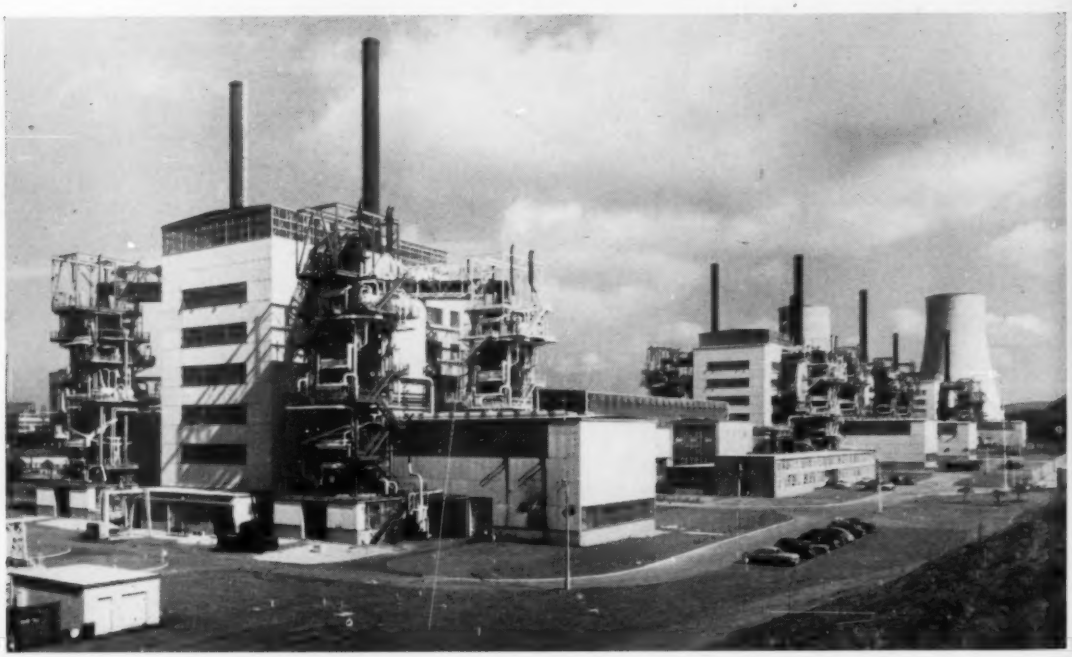
Towards the end of the year covered by the report, building operations had commenced at the new establishment at Winfrith Heath, Dorset. The first stage of the development at Winfrith has been planned to include a high-temperature graphite-moderated, zero energy reactor to be commissioned in 1959. At the end of the period, construction of th four nuclear civil power stations was under way. As a part of the Government's review of capital expenditure, it was announced in October that the nuclear power programme would be slowed down by twelve months. The programme now provides for 5,000—6,000 MW of capacity by the end of 1966.

During the year Sir Christopher Hinton resigned from the Authority and Sir William Cook was appointed. Early in 1958 alterations in the structure of the Authority were planned with the object of relieving the full-time technical members from executive duties. Dr. B. F. Schonland was appointed Director of the Atomic Energy Research Establishment when he took over the executive responsibility from Sir John Cockcroft. During the year the Authority's staff increased by about 10 per cent to over 30,000.

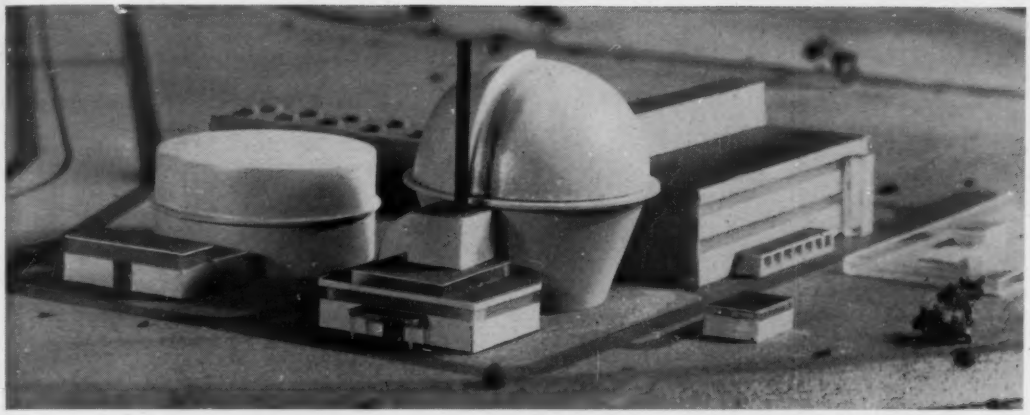
Thermonuclear Reactions

The most outstanding event was the commissioning of ZETA which took place in August, 1957. The machine was run up to full power on 30th August, when nuclear reactions in deuterium were detected by the neutrons emitted. The apparatus operated more successfully than was expected from the knowledge available for the design and was described in the *Electrical Review* of 31st January, 1958. Spectroscopic measurements indicated ion temperatures of from one to five million deg C, maintained for periods up to three milliseconds. ZETA has since been in regular operation except for plant maintenance and for the institution of experiments to diagnose

* H.M. Stationery Office, price 4s 6d.



Calder Hall showing the "A" and "B" power stations with "B" station nearing completion



Model of the advanced gas-cooled reactor, the building of which is expected to start in the third quarter of this year, if planning permission is granted

the exact nature of the nuclear reactions taking place.

Since the period covered by this annual report it has proved possible to obtain more information about the origin of the neutrons produced in ZETA. At a discharge current of 200,000 A, the plasma emits about four million neutrons per pulse. By a variety of tests it has been definitely established that this came from collisions between deuterium nuclei in the body of the gas and not from impacts with deuterium absorbed on the tube walls. The yield of neutrons is, however, about ten times higher than would be expected at the temperatures indicated. The great majority of the neutrons are produced by the deuterium nuclei which have been accelerated to energies of about 17,000 electron volts in the direction of the current. These deutrons can readily produce neutrons by fusion with nearby stationary deutrons. It has not been possible to indentify the smaller number of neutrons which are to be expected from a true thermonuclear fusion process.

Work is now going on at Harwell to clarify the knowledge of the process occurring in ZETA in preparation for a more powerful machine. This information will be obtained by increasing the current in ZETA, by devising new methods of measurement and developing the instruments required.

At a Press conference in London last week, presided over by Sir Edwin Plowden, it was stated that it was hoped to reach 10 million deg C with ZETA 1B early next year. ZETA 1B would be the original apparatus with a second modification. The design of ZETA 2 has been started. This would also be a toroidal machine and would probably be built either at Harwell or Winfrith Heath. With this larger machine it is hoped to reach the break-even temperature of 100 million deg C.

Research on controlled thermonuclear reactions is also being carried out at the Atomic Weapons Research Establishment where the effort has been largely concerned with the problem of achieving high temperature in the gas. The preferred present approach is to heat the gas by the method of cylindrical shock heating compression. The simplest equipment is the straight discharge tube in which the current passes between plate electrodes and returns via a coaxial metallic sheath closely surrounding the tube. The rate of rise of current in the apparatus has exceeded a million million amperes per second.

Since the beginning of the period covered by the report the conditions governing the supply and demand of uranium have altered and it now appears that, for some years at least, more uranium will be available than required. This is principally because uranium supplies have been developed faster than was foreseen. The Authority's own requirements have been somewhat reduced by the slowing down of the nuclear power programme. South Africa continued to supply much the greater part of the Authority's imports of uranium and concentrates during the year.

Production Reactors

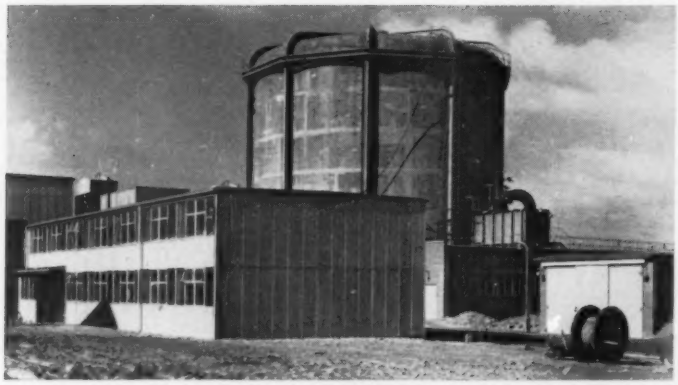
Following the accident in No. 1 pile at Windscale last October, No. 2 pile was shut down and will not be restarted until the Fleck Committee has reported on the conditions to be complied with in operation. The Windscale accident occurred during a controlled release of the energy which had accumulated in the graphite moderator (Wigner energy). The accident is believed to have been caused by unduly high temperatures in certain regions of the pile leading to the failure of one or more uranium cartridges.

At Calder Hall "A," No. 1 reactor was completely discharged in April, 1957, and the "gags" which control the flow of coolant gas through each individual channel were adjusted to bring temperatures into line with design. On restarting, a heat output of 180 MW was achieved with an electrical output of 42 MW. In August the heat output was increased to 200 MW with an electrical output of 45 MW, and this has been maintained.

Construction work progressed satisfactorily at Calder Hall "B" and No. 3 reactor, together with two turbo-alternators, was handed over to the Operations Branch in February. The reactor became critical in March, 1958. Construction of No. 4 reactor was virtually complete at the end of the period.

At Chapelcross some of the ancillary buildings, including the administration block, had been completed by 31st March, 1958. The first reactor, due to be handed over in September next, had reached the final stages in equipping the pressure vessel circuits and other mechanical and electrical installations. On the third reactor, the stage of stress relieving the pressure vessel had been reached, and the biological shield walls of the fourth reactor were complete. The turbine hall and control building were weatherproof; the first turbo-alternator and dump condenser had been installed.

Some delay in the completion of the fast breeder reactor



A view of the D.M.T.R. reactor at Dounreay

at Dounreay has been caused by the diversion of effort necessitated by the Windscale accident and the date when the reactor will become critical has been postponed for several months from 1st April, 1958. All the civil engineering work and the major mechanical construction in the reactor building were completed within the period. The steel containing sphere, 135ft in diameter, was successfully pressure-tested.

The gas-cooled, graphite-moderated reactor for power production is being further developed by the industrial consortia. Higher temperatures can be achieved by replacing the uranium metal by a ceramic compound, and by replacing magnesium as the canning material by some other metal, such as beryllium. This represents such a major change in design that it is considered desirable to develop the new technologies involved by building a prototype reactor. The planning of this project started in September, 1957. The objective is the design, construction and operation of a carbon dioxide-cooled, graphite-moderated reactor operating at a temperature intermediate between the improved Calder Hall type of reactor and the high temperature, gas-cooled reactor system. The present intention is to use beryllium-clad uranium oxide as fuel, but the reactor will be designed in a way that permits alternative forms of high temperature fuel to be tested on a large scale. The uranium oxide will be enriched to about twice the normal concentration of uranium-235, which should permit higher burn-ups to offset the greater initial cost of beryllium cans and enriched fuel. The plant will have a mean core rating of 8 MW (heat) per tonne of uranium contained in the fuel, with parts reaching a peak rating of almost 18 MW (heat) per tonne, which will provide a substantial lead over the ratings expected in the civil stations up to 1965. It is proposed to site the reactor at an existing establishment, and work is expected to start in the third quarter of 1958. The reactor should be in operation by mid-1961.

Research Reactors

A large new materials-testing reactor, PLUTO, which became critical at Harwell in October, is a heavy-water moderated reactor using enriched uranium fuel and running at 10 MW power. It is much like DIDO, which first operated in 1956. Since October, 1957, PLUTO has been used for a series of trials at low neutron flux. When fully operational it will have a high neutron flux and will be used for testing materials and components.

DIDO was brought up to the designed high thermal-neutron flux in stages and has been operating at this flux for 80 per cent of the time since March, 1957. A large programme of work on the effects of radiation on fuels and other materials is planned in connection with DIDO, PLUTO and other reactors.

A reactor (D.M.T.R.) practically identical with PLUTO is nearing completion at Dounreay. This reactor will have eighteen cavities in which specimens may be irradiated at various fluxes. In an initial programme of work in connection with the development of gas-cooled thermal reactors for civil power stations, the reactor will be used for irradiation of uranium fuels, canning materials, graphite and other materials. This will be followed by longer term work on the measurement of the physical and mechanical properties of these materials during irradiation and also work upon the properties of steels suitable for constructing reactor pressure vessels.

Another reactor at Harwell, NEPTUNE, became critical in November, 1957. This is a zero energy reactor, moderated by ordinary water and fuelled with enriched uranium, and is designed to allow many different kinds of cores to be assembled rapidly. It is being used to study the physics of water-moderated reactors, and especially of pressurised-water reactors for ship propulsion.

HAZEL (formerly called ZETR II) is a zero energy reactor in which the fuel is a solution in heavy water of uranium-235 or uranium-233. The reactor is made critical by pumping the solution into a cylindrical tank surrounded by a graphite reflector. The first experiment with this reactor was completed in February, 1958.

Light Weight Shielding

LIDO, the 100 kV swimming-pool reactor, has operated at various flux levels throughout the year in order to supply a source of radiation for experiments on light weight shielding. The main aim of these experiments has been the development of a shield for the submarine nuclear reactor. NERO, the zero energy, graphite-moderated reactor, has been operated during the year with five different arrangements of fuel in the core. The detailed study of neutron behaviour in each of these cores has indicated improved theoretical methods that may be used in designing the advanced gas-cooled, graphite-moderated nuclear power stations.

ZEPHYR and ZEUS, the two zero energy fast reactors, have been used to obtain experimental data required for the development of fast reactors. In ZEPHYR, which is fuelled with plutonium, the possibilities have been explored of fast reactors in which there is some multiplication of thermal neutrons. The zero energy study in ZEUS (the uranium-fuelled system) of a simulated Dounreay fast reactor core was completed and the reactor has now been dismantled.

A light-water-moderated research reactor, HERALD, with forced water cooling, capable of operating at 5 MW heat output, is being constructed at the Atomic Weapons Research Establishment. Its purpose is to provide intense beams of thermal and epithermal neutrons for general nuclear physics experiments, and an experimental region of high neutron flux for the irradiation of small samples to be used in radiochemical research. The high unmoderated flux available will also be applicable to studies of fast neutron damage in materials. An experi-

mental facility, HORACE, has been constructed for the study of possible core arrangements in HERALD.

Possible Reactor Systems

During the year the Authority's continuing appraisal of a wide variety of possible reactor systems has made it possible to discern with greater clarity the lines along which advances are most likely to be made during the next two decades. A primary objective during the 1960s will be to realise the maximum development potentialities of the gas-cooled, graphite-moderated reactor system. In parallel with this work, the Authority is continuing to study the development of other systems which might be employed in succession to, or alongside, the latest reactors of the gas-cooled system. By the 1970s, work on the fast breeder reactor system may have reached a stage at which commercial power stations can be built. Another system with a long-term development possibility, the high-temperature gas-cooled reactor, is receiving detailed consideration as a potential large-scale nuclear power station reactor.

The best possible alternative system for a commercial nuclear power station in the late 1960s may well be a heavy-water-moderated reactor. This conclusion has been reached in the course of feasibility studies of this class of system for small land-based power stations and for ship propulsion. The reactor does not necessarily require a containment vessel capable of withstanding a high pressure, and a design requiring only a low enrichment of the uranium fuel may be possible. It may also be suitable for a plutonium recycle fuel scheme in which the fuel feed is natural uranium. At present the main emphasis of the study is on the engineering aspects and if a satisfactory design can be evolved the first commercial station might be commissioned in the late 1960s.

A design study of the sodium-cooled, graphite-moderated reactor was completed in 1957 but it has been decided that no further work should be undertaken on this graphite reactor system for the time being.

The inside of NEPTUNE after the top shielding has been removed and the water moderator drained off. This is now in operation at Harwell

During the year, the Admiralty Committee established to study the use of reactors for the propulsion of merchant ships continued its work. The main objective of the committee, on which the Authority has two representatives, has been to determine a reactor system which would show a prospect of being both efficient and economic in use for marine propulsion. One conclusion from these studies is that a scaled-down version of the present Calder Hall type of reactor would not be suitable for marine propulsion, except for very large vessels. It would be another year before they knew if an economic reactor for large ship propulsion could be designed. If it was decided that it was likely to be successful and a decision was taken to go ahead, it would be about 1964 before a ship so equipped was commissioned.

International Relations

In the international sphere the most notable event was the inaugural meeting of the International Atomic Energy Agency in Vienna on 1st October, 1957. Bilateral agreements were concluded during the year between the United Kingdom and the Governments of South Africa, Norway, Sweden and Italy. The European Nuclear Energy Agency (of which the United Kingdom is a member) was established by decision of the O.E.E.C. Ministerial Council taken in December, 1957: the Agency came into being on 1st February, 1958. The Euratom Treaty between France, Western Germany, Italy, Belgium, Holland and Luxemburg came into force on 1st January, 1958.

Collaboration with Industry

The Authority collaborates with the industrial consortia and acts as consultants to the Electricity Boards in connection with the nuclear power programme. In addition, collaborative programmes of development work relating to the gas-cooled, graphite-moderated reactor system are formulated by a committee on which the four consortia and the Authority are represented, and facilities have been provided at Harwell for collaboration between the consortia in the carrying out of exponential experiments.

Staff from Atomic Power Constructions, Ltd., have received training in the Authority's Industrial Group during the year under review. A new industrial partnership, Hawker Siddeley/John Brown Nuclear Constructions, Ltd., was formed in the summer of 1957. The new company intends to study the nuclear propulsion of merchant ships.

Industry has participated in the work on controlled thermonuclear reactions. The principal contractors for construction of ZETA were Metropolitan-Vickers Electrical Co., Ltd. (who also collaborated in the design), British Insulated Callender's Cables, Ltd., and Telcon, Ltd. Research work in this field is also being carried out by Associated Electrical Industries, Ltd.'s Research Laboratory under contract with the Authority.

The scope of the Reactor School at Harwell was considerably extended during the year. Starting with the first course in 1958, the standard course has been increased from fourteen to sixteen weeks, and the first six weeks of the course are now held at one of three colleges of advanced technology. During the year 378 British and 120 overseas students attended courses.

Six-week courses have been held at Calder Operations School. Three were for British students and three mainly for overseas students. Thirty-two British students and 41 overseas students attended. A special one-week course was held for overseas industrialists in October, 1957.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Hydro-Electric Generation

YOUR issue of 4th July contains, in its leading article, a statement, which as a Scotsman and a consumer within the area served by the North of Scotland Hydro-Electric Board, I feel I cannot allow to pass unchallenged. "The Scottish hydro-electric schemes," you allege, "enable the number of small industries throughout the Highlands to be increased. . . . In fact, industrial loads build up near the hydro stations, a very economic arrangement."

One would infer from this that you mean economic from the consumer's point of view, or is it possible that you regard it only from the Hydro-Electric Board's angle? If the former, you are wrong, if the latter, you are right, for the Board's lines are thereby shortened and cheapened. But an industrial consumer in the Board's area pays more for his electricity than if his factory were in Yorkshire! Indeed, the economics of the system have become so topsy turvy that current from Scottish hydro stations is transmitted long distances to the North of England and sold there for less than is paid by a Scottish consumer a few yards from the hydro station where the current is generated. One wonders, therefore, just how industry can be maintained in the Highlands, let alone attracted to them. In actual fact, figures of employment show that this area is considerably worse than the rest of the country, and is not improving.

You are correct in saying "the rehabilitation of the Highlands was the primary object in setting up the Hydro-Electric Board," but apart from the effect of the initial capital expenditure, the economic result of the Board's creations has been and must remain a dismal failure. The first paragraph of your article gives the cost of hydro generation of electricity as 0·59d per kWh, as against steam generated at 0·86d. Why, therefore, should current within the Board's area be more costly than in England? The Board's officers try to explain it on grounds of sparse population and high distribution costs. But according to what has been said by representatives of and supporters of the Board, it is the sparse population and lack of industry which that body is doing its best to rectify. It would be interesting to know how those gentlemen propose to attain their praiseworthy objective when current within the Board's area is higher priced than in areas outside it.

Rosehall, Banffshire. S. G. LAIDLAW.

The North of Scotland Hydro-Electric Board has seen a copy of Mr. Laidlaw's letter and makes the following comments:—

The Board's charges for industrial consumers are less than the average for the whole country despite much the lowest consumer density per square mile. The low tariffs in the Highland area are possible only because hydro generation is cheaper than generation by steam.

The units consumed per annum by the Board's industrial consumers have increased from 149 million in 1948 to 324 million in 1957, an increase of 117 per cent. The number of industrial consumers—and it is admitted that many of these are of small capacity—has increased from 3,650 to 7,143 during the past ten years.

The Board does not sell electricity to the North of England but supplies power at peak hours, and at a profitable price, to the South of Scotland Electricity Board at suitable points in mid-Scotland. In their report the Select Committee on Nationalised Industries commended this arrangement as being of advantage to the Hydro Board.

The Board, although not acting alone, has made, and is making, strenuous efforts to influence manufacturers to go north and already have succeeded in encouraging leading electrical firms such as Ferranti, G.E.C., B.T.H. and Smith Meters to establish themselves there. The chairman of a limestone quarry recently opened at Ullapool, for example, stated that had the Board's supply not been available he could not have afforded to start there and that the quarry would still be dormant.

The Select Committee, which examined the Board's affairs, stated "In the fourteen years of its existence the Board has impressively justified the faith of its progenitors. It has by now taken its place in the Scottish scene as a firmly established concern."

Electricity in Agriculture

"REFLECTOR'S" reference in "Views on the News" in your issue of 18th July to the article by Sir Oliver Lodge in July, 1908, reminded me that I attended the fifth Kelvin Lecture at the Institution of Electrical Engineers in January, 1914, given by Sir Oliver Lodge, in which he devoted the latter part of his lecture to the electrification of crops and described experiments which had been carried out in this country with wires supported on poles, the wires being raised to a high positive potential (*J.I.E.E.*, Vol. 52, 1914, p. 341).

He also mentioned that Professor S. Lemström was one of the pioneers in this work and I have in my possession the latter's little book "Electricity in Agriculture and Horticulture" published by the *Electrician* in 1916. Lemström described experiments on a variey of crops which he either conducted himself or had carried out for him in Finland, Germany, Sweden, France and this country. He used a Holtz frictional machine or a Wimshurst machine driven by an electric motor or a hot air engine as his source of high potential; in nearly every case there was a considerable increase in yield. Lemström's conclusions were that he had made out a good financial case for the electrical treatment of crops.

The first world war brought all these experiments to an end, and as far as I know no further interest seems to have been taken in the matter. It is rather surprising that the Ministry of Agriculture has not arranged to carry out further tests, especially as equipment for producing high-voltage d.c. is now readily available, and workers in this field of research would not be operating under the handicap of using crude apparatus which would not function in damp weather. I anticipate the reply that the present high cost of equipment and labour would rule the experiments out as uneconomical. It would be interesting to know what effect electrification would have on the hop crop; I mention this as the same ground appears to be used year after year whereas, of course, with most other crops rotation is practised.

Another suggested application of electricity to agricul-

ture would be soil heating on a large scale; it is at present used in horticulture in only a small way. In the not so very distant future with more and more atomic stations replacing the conventional generating stations the time will come when at times of low demand the surplus energy produced may be a considerable embarrassment, and soil heating on a large scale during the night might be an economic way of disposing of this surplus energy. With an ever-increasing population and more and more agricultural land being used for roads, new towns and airports, every consideration should be given to making the best use of what remains. Only by so doing can our imports of food be kept down and so reduce the gap between imports and exports.

Welling, Kent. J. F. PERRIN, A.M.I.E.E.

WITH reference to the note on p. 105 of the *Electrical Review* of 18th July, Sir Oliver Lodge started a company to deal with electricity in agriculture. A cousin of mine, Miss Dudgeon, put up a similar installation at Lincluden Mains, near Dumfries, and ran it with the help of Professor Priestley of Leeds. It consisted of a large spark coil, mercury interrupter (which gave a lot of trouble), two vacuum rectifier bottles, with spiral anodes, and a grid of wires at about 40ft spacing in the fields. She claimed 24 to 40 per cent increase in yield of potatoes. I read a paper about it to the Junior Scientific Society at Oxford in 1913.

After the 1914-18 war the Ministry of Agriculture set up a committee under Professor Priestley to investigate it, and some work was done at Rothamsted which gave statistically insignificant results. The provision of adequate "controls" was always difficult—the effect, if any, went down wind. I rather incline to think there was something in it, but whether it was the combination of atmospheric nitrogen or traces of copper from the overhead wires is hard to say. Odd things happen under h.v. lines—even of aluminium.

Miss Dudgeon was also interested in the effect of mercury vapour lamps in greenhouses, and had some Cooper-Hewitt glass tubes in a tomato house which gave spectacular results as far back as 1910-12.

Little Hadham, Herts. (DR.) H. DENHAM.

Electricity Supply Load Factor

MR. BELLAMY'S article in your issue of 25th July is a welcome reminder of the importance of load factor improvement but he is somewhat optimistic, and perhaps a trifle complacent, regarding the Area Boards' efforts in this direction. It is true, as he says, that financial incentive cannot be a major factor in determining the time of use of electricity because of the small proportion which electricity costs form of the total domestic or factory budget. But, however weak, the financial incentive operating through tariff differentials is the only weapon the Board possesses, and it should be used to the utmost extent that the costs justify and that the practical conveniences permit.

Mr. Bellamy refers to the danger of overdoing the off-peak tariff and creating an artificial market by an unjustifiable biasing of prices. This is a quantitative problem and must be discussed in figures rather than in words. Two questions may, however, be asked regarding the price differential offered between restricted and unrestricted supplies, namely:—Is it high enough to represent the real differences in cost of supply?; and Is it high enough to compensate the consumer for the inconvenience of the restriction?

As regards the other branch of the load factor campaign, namely avoiding the peaks as distinct from filling up the valleys, Mr. Bellamy says in effect "Let's not be beastly to the peak-load consumers." Tariff construction, he suggests, is already based on a correct allocation of peak-load cost so why should peak-load consumers pay more? They are the foundation of the source of revenue: moreover if the cost to peak-load consumers were increased artificially it could well result in the loss to competitive fuels of some of the electrical load which at present contributes effectively to load factor improvement.

It could, and, with equal plausibility, it could merely serve to discourage those loads which attach specifically to cold winter mornings and whose loss to competitive fuels might prove a real gain to the electricity industry. Against these various hypotheses one solid fact stands out that whenever the country experiences a mild winter the industry registers a better-than-average load factor, whereas when there is a cold-snap winter the load factor goes down. Something clearly comes on in cold weather which increases the maximum demand to a greater degree than it increases the consumption: somehow or other the industry has acquired a weather-sensitive load, and it would be a bold man who would aver that under present tariffs this particular load pays its cost of supply.

Let us stop pretending that costs are not what is indicated or that our tariffs precisely represent them, and claim rather that our tariff system is just a useful working compromise which we hope in due course to improve. Surely the objection, for example, to time-varying electricity charges is not any economic unsoundness but the sheer practical difficulty of implementing them. We are far too ready to dismiss peak costs with a few easy words —either spell-binders like "diversity" or pejoratives like "artificial"—instead of admitting quite frankly that there are elements in our load (just as in other service industries) which we have so far just not discovered how to make pay for their costs.

London, N.W.6. D. J. BOLTON.

Adequate Wiring Campaign

THE members of the Accessories Section of the B.E.A.M.A. definitely believe in, and care about, the benefits which electricity can bring to civilised living and view with grave concern the bottle-neck between the electricity supply and the user, caused by inadequate wiring.

With help and guidance from B.E.A.M.A., we have launched an Adequate Wiring Campaign the ultimate object of which is to convince the user that the advantages of electrical living can only be achieved by an adequate wiring system. This can only be done by well conceived publicity backed by the whole of the industry.

However, before this final stage is reached, an appreciation of the whole problem must be made, and matters of a technical and economic nature taken into consideration. Furthermore, co-operation must be obtained from those connected with legislation, regulations, specifications, and the like. At the moment work is proceeding in the initial stages of this campaign.

It must be stressed that this is a problem which concerns the whole of the industry, and if this campaign is to succeed, all members must play their part to ensure that the benefits of electricity are made available to the millions of homes which at the moment cannot enjoy electrical living.

London, W.C.2. J. A. C. KENDLE,
Chairman,
Accessories Section,
British Electrical and Allied
Manufacturers' Association.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Eastern Electricity Board has appointed **Mr. G. M. D. Shaw,** B.Sc., M.I.E.E., to the staff of the engineer in the Essex Sub-Area. Since nationalisation he has been Thurrock District engineer. Mr. Shaw was educated at Clapham Central School, London, and the Polytechnic, Regent Street. He joined the staff of the County of London Electric Supply Co., Ltd., in 1923 and subsequently occupied various engineering positions with that company. During the war he was district mains engineer at Romford and at vesting day occupied a similar position at Hornchurch. In 1928 he took the external B.Sc. degree in engineering at the University of London and he is a member of the Standing Committee of Convocation of the University.

Mr. D. J. Agnew, A.M.I.E.E., has been appointed engineer to the Thurrock District of the Eastern Electricity Board in succession to Mr. Shaw. Mr. Agnew was educated at the Royal Grammar School, Colchester, and he received his technical training at the North Essex Technical College, Colchester, at the Mid-Essex Technical College, Chelmsford, and at the Rotherham College of Technology. He entered the electricity supply industry in 1938 with a student apprenticeship with the Colchester Corporation Electricity Department and on completion was appointed a junior engineer with the undertaking. During the war he held a commission in the R.N.V.R., and in 1947 was appointed assistant mains engineer with the Sheffield Corporation Electricity Department.

Mr. D. J. Agnew

Two years later he became third assistant engineer in the Sheffield Sub-Area of the Yorkshire Electricity Board. In 1956 he was appointed first assistant district engineer with the Merseyside and North Wales Electricity Board. Mr. Agnew served for five years on No. 10 District Joint Board for the supply industry and is a past member of the National Executive Council of the Electrical Power Engineers' Association.

Siemens Edison Swan, Ltd., announces further appointments in its Cable Divisions. **Mr. R. G. Holland,** A.M.I.E.E., has been appointed assistant cable sales manager, special contracts, and **Mr. R. B. Tucker** has been appointed assistant sales manager of the company's rubber and plastic cable division.

Mr. R. G. Holland

Mr. R. B. Tucker

Mr. Holland was a school apprentice with Metropolitan-Vickers and, following naval service, he returned to Trafford Park to work successively in the Plant, Transformer and Switchgear Departments. After four years with the Dominions Division of the Metropolitan-Vickers Export Co., in London, he became assistant to the chairman of Associated Electrical Industries, Ltd., in 1955 and joined Siemens Edison Swan, Ltd., in April this year.

Mr. Tucker joined the Royal Navy through public school entry in 1940, serving until 1955 and attaining the rank of lieutenant-commander when he retired at his own request to join Siemens Brothers & Co., Ltd., becoming principal assistant to the sales manager, rubber and plastics cable division.

Mr. G. E. Sugden has been appointed sales manager of Ketay, Ltd., Romford, Essex, manufacturers of synchros and servo components and systems. He was previously with the Sperry Gyroscope Co., Ltd., for nearly 11 years, and was latterly assistant manager of that company's Aeronautical Department. Before joining Sperry, he was in the applications section of the M.O. Valve Co.'s development laboratory, and during the war served in the Radar Branch of the Royal Air Force.

Mr. G. E. Sugden

The South Eastern Electricity Board announces that **Mr. F. G. Robinson,** Associate I.E.E., has been appointed manager of the Twickenham and Richmond District; he has been acting manager. **Mr. T. A. Crisp** has been appointed commercial officer of the Surrey Sub-Area, in succession to **Mr. S. F. Osborne,** who has joined the Eastern Electricity Board.

Mr. J. K. Johnson, B.Sc.(Eng.), A.M.I.E.E., assistant editor of the *Electrical Times,* has been appointed press officer of the Central Electricity Generating Board, Winsley Street, W.1.

Mr. P. J. Field, former press officer, has been appointed chief assistant P.R.O. in the Board's public relations section.

The Simplex Electric Co., Ltd., announces that **Mr. B. Perrott** has been appointed manager of its Birmingham branch. Mr. Perrott joined Simplex in 1947, following war service in the Royal Artillery, and until 1954 he represented the company in Birmingham and the North-West Midlands. In that year he was appointed manager of the Leicester branch, and now relinquishes this position in order to move to Birmingham.

Mr. B. Perrott

Mr. R. M. Caffelle

Mr. R. M. Caffelle will succeed Mr. Perrott as branch manager at Leicester. Mr. Caffelle served throughout the war in the Royal Air Force, and before joining Simplex in 1954 as "Creda" sales engineer in the East Midlands, he was senior assistant (development) on the staff of the East Midlands Electricity Board, Coventry Sub-Area.

The first list of life barons announced last week includes **Sir Charles Geddes,** a part-time member of the Central Electricity Generating Board and a member of the General Council and former president of the Trades Union Congress.

Three members of the staff of E.M.I. have just completed 50 years' service with the group. They are **Mr. G. Taylor,** aged 73, **Mr. A. Fitch** (67) and **Mr. G. Collins** (66). At an informal meeting held recently in E.M.I.'s boardroom, Mr. J. F. Lockwood, the chairman, presented them with gold watches and cheques. Mr.

L. J. Brown and Mr. C. Metcalfe, C.B.E., managing directors, and several other senior executives were present. Mr. Taylor and Mr. Fitch retired from E.M.I. after the presentation, but Mr. Collins will continue to serve until next September.

Mr. W. F. B. Nott, O.B.E., T.D., has joined the board of A. H. Hunt (Capacitors), Ltd., in the capacity of commercial director.

Mr. W. F. B. Nott

The Southern Area competition of the **Electrical Industries National Golf Championship** was held at Brockenhurst, Hants, on 16th July. The following winners qualify for the national finals which are to be held at Wentworth at the end of next month:—Mr. J. Holton (Southern Electricity Board, Southampton), Mr. J. Mills (Lewcos) and Mr. J. Shotton (Philips Electrical, Portsmouth). Mr. P. E. Weygood was the winner of the veterans' prize. Thirty-two competitors took part in the competition but only the early starters were able to finish the course, for a very heavy thunderstorm flooded the course at about noon.

On 12th July the **G.E.C. Championship Sports** were held on the Magnet Club Sports Ground, Witton Engineering Works, Birmingham. Mr Leslie Gamage, chairman of the company, and the Hon. Mrs. Leslie Gamage attended the meeting, supported by members of the board and the management of the Witton Works.

Birmingham and London shared the honours in the Challenge Cup races, Birmingham winning the three ladies' events and London the five men's events, in each of which Birmingham finished second.

On the Electricity Stand at the recent Royal Welsh Show. Left to right: Mr. J. Rankin, deputy chairman, Merseyside and North Wales Electricity Board, Mr. T. R. Smith, assistant chief commercial officer, and Mr. R. N. Pegg, manager, No. 4 (Wrexham) Sub-Area

The Hon. Mrs. Leslie Gamage at the G.E.C. Birmingham sports. On her right are Messrs. D. J. Rollason and Mr. Gamage: on her left Mr. and Mrs. J. J. Gracie and Mr. C. Perry

At the close of the meeting Mrs. Gamage presented the prizes, and the day's activities closed with a dance at the Magnet Club.

Prem J. Bhatt, of the Brush Electrical Engineering Co., Ltd., Loughborough, has been awarded the degree of Doctor of Philosophy in the Faculty of Applied Science by the University of Nottingham. Dr. Bhatt was seconded for part-time research by the company in 1953, to study certain aspects of non-linear servo-mechanisms. He is employed in the research division and was associated with the design, commissioning and testing of the complete power equipment supplied by the company for the automatic control system for the radio telescope at Jodrell Bank.

Prem J. Bhatt

Dr. Bhatt, who is an Indian, has been with the company since 1951. He is a past chairman of the Graduate and Student Section of the East Midland Centre of the Institution of Electrical Engineers and former secretary of the equivalent section of the Institution of Mechanical Engineers. He has recently been elected associate member of both these Institutions. He has been awarded two Student Premiums of the I.E.E. for papers on servomechanisms read before the local Student Section.

Mr. K. Elphinstone, M.B.E., has been appointed export manager of E.M.I. Electronics, Ltd. He takes up this post following **Mr. R. W. Addie's** recent appointment to the board as marketing director. From 1939 to 1946 Mr. Elphinstone served with the R.E.M.E. on radar and communications, attaining the rank of major. After the war he was for several years with the Planning and Installation Department of the B.B.C. before going into commerce on the export side of electronics.

Oldham Battery Sports Club (**Oldham & Son, Ltd.**) held its field day at Broomstair, Cheshire, on 20th July. The programme for the afternoon included a three-a-side cricket tournament, bowling handicap and tennis tournament. Mr. John Oldham, chairman of the company, was present.

Mrs. M. E. Newland, joint managing director of Goodmans Industries, Ltd., has been appointed to the board of Relay Exchanges, Ltd. The share capital of Goodmans Industries was recently acquired by Relay Exchanges.

Mr. P. W. Faulkner, O.B.E., general manager of the chemical and metallurgical division of the Plessey Co., Ltd., since 1953, has been appointed a director and general manager of Plessey International, Ltd. Mr. Faulkner, who joined Plessey in 1952 at its head office, Ilford, remains an executive director of the Plessey Co. and a director of Technical Ceramics, Ltd.

Mr. P. W. Faulkner

Edward Dewhurst, Ltd., Preston, announce the appointment as general manager of **Mr. D. Benn,** B.Sc.(Eng.), A.M.I.E.E. Mr. Benn was trained at Sheffield University, Rotherham Technical College and Battersea Polytechnic and was apprenticed in the

ELECTRICAL WHO'S WHO

The fifth edition of the "Electrical Who's Who" is now available. Its nearly 8,000 entries cover all branches of the electrical industry and profession. Copies are obtainable at 27s 6d (postage 1s 6d) from Electrical Review Publications, Ltd., Dorset House, Stamford Street, London, S.E.1., or from booksellers

electrical department of Thomas Firth and John Brown, Ltd., Sheffield. He subsequently held various appointments in the engineering department of that company before joining the Technical Division of Lever Bros. and Unilever, Ltd., London, as assistant electrical engineer. In 1952 he joined Garringtons, Ltd., Bromsgrove, Worcester, as electrical engineer and subsequently was appointed contracts manager of that company's induction heating division.

Mr. J. Whitehead, A.M.I.E.E., has been appointed managing director of the Electro Mechanical Manufacturing Co., Ltd., Scarborough. He has been with the company since 1946, first as general manager and later as works director. Mr. Whitehead received his technical education at the Manchester College of Technology, of which he is an associate, and his training with Erskine Heap & Co. Later he was with Crompton Parkinson, the Harland Engineering Co., Ferguson Pailin and Platt Bros. He was appointed to the board of the Electro Mechanical Manufacturing Co. in 1950.

Mr. J. Whitehead

Following the death of Mr. T. C. Gilbert, chairman and managing director of Gilflex Conduits, Ltd., **Mrs. D. A. Gilbert** has been appointed chairman and **Mr. R. G. Hardy,** formerly sales director, is now managing director.

Mr. E. K. Cole, C.B.E., chairman and managing director of **E. K. Cole, Ltd.,** presented gold watches to eleven employees who have completed twenty-five years of service with the company at a recent ceremony in the Ekco Clubhouse.

Mr. E. F. Dunkin, Graduate I.E.E., has been appointed by Venner Electronics, Ltd., as its United Kingdom sales engineer, responsible for technical liaison and sales promotion of its range of transistorised packaged units and test equipment. Mr. Dunkin was previously with the components division of Fortiphone, Ltd.

Mr. P. Allen has been appointed publicity manager of Access Equipment, Ltd. He was formerly advertising manager of Desoutter Bros., Ltd.

Among the awards announced by the Council of the British Institution of Radio Engineers is its premier award for the most outstanding paper published in the Institution's *Journal* during 1957—the Clerk Maxwell Premium. This is awarded to **Mr. T. B. Tomlinson,** B.Sc., Ph.D., A.M.Brit.I.R.E., for his paper, "Principles of the Light Amplifier and Allied Devices." The paper was based on work carried out at the Research Laboratories of the General Electric Co., Ltd.; he is now with Computer Developments, Ltd.

At the July meeting of the **A.S.E.E. Golfing Society** at Wentworth, the results were as follows:—Liverpool Electric Cables trophy: Winner, Mr. E. A. Wordell; runner-up, Mr. G. H. J. Housden; wooden spoon, Mr. R. O. Taylor. President's prize: Winner, Mr. C. F. Boyes; runner-up, Mr. A. H. Chesters; wooden spoon, Mr. M. Knowles.

Mr. W. Millman has been appointed Post Office telephone manager for the Newcastle-on-Tyne area in succession to **Mr. G. Green,** who has retired.

Mr. D. H. Kettle, section leader of the Lift Section, Industrial Machines Department, at the British Thomson-Houston Co.'s Works, Rugby, retired on 24th June after 46 years' service with the company.

The **Midlands Radio Industry Golfing Society** held its monthly competition at Walmley Golf Club recently. The President's Cup was won by Mr. A. E. Shinton and the runner-up was Mr. E. R. Hill. At the dinner which followed, the captain, Mr. L. Wise, welcomed the president, Mr. E. A. Wood.

Siemens-Schuckert (G.B.), Ltd., sole agents in the United Kingdom and Northern Ireland for Siemens-Schuckertwerke A.G., Germany, have appointed **Mr. P. C. Patton** to be sales manager for this agency department. Mr. Patton was initially for five years with Siemens-Schuckertwerke in various works and has been a member of the Siemens-Schuckert (G.B.), Ltd., staff since 1930.

Mr. P. C. Patton

OBITUARY

Mr. W. R. Murray, who retired in 1945 after having been for twenty-five years burgh electrical engineer of Stirling, died on 17th July at the age of eighty. Before going to Stirling he was at the Ayr Corporation electric lighting and tramway power station, first as charge engineer, then as chief assistant, and finally as deputy manager, holding the latter position for twelve years.

WILLS

Mr. W. E. Groves, for 40 years mains engineer with the Birmingham Corporation Electric Supply Department, who died on 30th January last, left £6,384 gross (£6,314 net). Among his bequests he left £50 to the I.E.E. Benevolent Fund.

Mr. G. W. Franklin, founder and senior director of G. W. Franklin & Son, Ltd., electrical contractors, who died on 28th December last, left £9,673 gross (£9,555 net).

Mr. T. S. Parkinson, A.M.I.E.E., former borough electrical engineer of Leigh, Lancs., and district engineer of the North Western Electricity Board's Leigh District, who died on 14th February last, left £4,319 gross (£4,231 net).

Major F. H. Masters, O.B.E., T.D., M.I.E.E., formerly of *Engineering,* who died on 28th January last, left £5,352 gross (£5,231 net).

Mr. A. T. Ward, M.Sc., F.R.I.C., for thirty-three years in the research laboratory of the British Thomson-Houston Co., Ltd., Rugby, who died on 14th February last, left £6,361 gross (£6,255 net).

Mr. A. E. Cracknell, service manager of Belling and Co., Ltd., who died on 24th January last, intestate, left £4,955 gross (£4,770 net).

Mr. R. A. Grundy, managing director of Grundy and Partners, Ltd., electronic engineers, and director of Grundy of Teddington, Ltd., who died on 5th March last, left £24,307 gross (£23,583 net).

Mr. J. M. Buer, A.M.I.E.E., of Torquay, who died on 27th March, left £21,212 gross (£17,989 net). His bequests included £100 to the Benevolent Fund of the Institution of Electrical Engineers.

Mr. E. H. S. Bullen, M.I.E.E., London office manager of Pirelli-General Cable Works, Ltd., who died on 10th February last, left £10,418 gross (£10,149 net).

Mr. G. Auterson, A.M.I.E.E., principal electrical engineer surveyor to Lloyd's Register of Shipping, who died on 18th January last, left £4,439 gross (£1,838 net).

Mr. T. Dickinson, of 315, Laceby Road, Grimsby, electrical contractor, who died on 28th December last, left £3,751 gross (£3,693 net).

Mr. H. T. Eatwell, managing director of G. A. Harvey and Co. (London), Ltd., who died on 20th February, last, left £27,327 gross (£16,248 net).

Vitreous Heat-Resistant Material

Pyroceram is the name of a family of new basic materials made from glass, developed in the chemical research laboratories of the Corning Glass Company and now in commercial production. While different compositions can be made for different purposes, they are all tough, heat-resistant substances, harder than high-carbon steel, lighter than aluminium, many times stronger than plate glass and less expensive than steel.

The two types which are now available for industrial use are known as Code 9606 and Code 9608. Code 9606 has properties of hardness and resistance to high temperature which make it suitable for high frequency uses in electronics. With certain limitations the material can be pressed and rolled. Code 9608 can be supplied in tubing, rod and plate. Developed primarily as a general-purpose material, it can be formed by all automatic glass-manufacturing processes. It can be blown, drawn as tubing, pressed and rolled. It is non-porous and has a density below that of aluminium. Specific products that have been made from it include ovenware, pump parts and pipe caps. Other applications now under study are brake shoes, piston heads and bulkheads for nuclear surface vessels.

Reports on Lewisham and Dagenham Railway Accidents

THE reports on the inquiries into the railway collisions which occurred in dense fog last winter at Lewisham and Dagenham both attribute the accidents to the driver of the on-coming train passing a signal at red.

After the collision near St. John's Station, Lewisham, on 4th December, 1957, in which 90 persons were killed, the colour light signalling equipment was thoroughly tested and found to be in order throughout. In his report (published last week), Brigadier C. A. Langley, Chief Inspecting Officer of Railways, says that he is convinced that Driver W. J. Trew (whom he holds solely responsible) did not see three signals and his attempt to stop the train when his fireman called out that the last signal was a red was made too late. He was not expecting to be stopped at that signal and was no doubt taken by surprise.

In his recommendations Brigadier Langley says that the accident should have been prevented by automatic train control of the warning type. Alternatively, if Trew had been in charge of an electric or diesel electric train with no obstructions in front of the driver's cab he could scarcely have failed to see the powerful colour lights, although they were on the right of the line. The British Transport Commission had planned to install automatic warning control on all the main lines in the country, and they had given an assurance that they would do all they could to accelerate the programme. In the Southern Region it was being applied first where semaphore signals were used, but in view of the density of the traffic on the Eastern Section main line, on which the accident occurred, its equipment with ATC would rank high in the next stage of the programme. Automatic warning control would not relieve drivers of their responsibility to observe signals, but it would help them in conditions of poor visibility. Multi-aspect colour light signals were also of great value in such circumstances and were being installed in increasing numbers.

Statistics showed that the provision of train stops at stop signals, in addition to warning control at distant signals, would add little to the safety of travel and that during the 46 years from 1912 to 1957 31 per cent of the fatalities in train accidents might have been saved by warning control alone, while with both forms of control this figure would have risen only to 38 per cent. The cost of equipping the main lines with warning control would be high but the cost of installing both systems would in no way be commensurate with the advantages obtained. The warning system now being installed by British Railways he considered the best practical aid to drivers in controlling their trains safely in all weather conditions.

With regard to other suggestions for improving railway safety, Brigadier Langley says that the general conclusion is that radar is not applicable at present to railway conditions. Radio, although used in other spheres of railway operation, had not been found suitable for controlling the movement of trains in this or other countries with similar railway systems due to the difficulty in ensuring that the messages were received and properly understood by the right persons. The possibilities arising out of the development of electronics were not being neglected by the British Transport Commission, and investigations into its application were proceeding.

In his report on the Dagenham collision, which occurred on 30th January, 1958, Brigadier Langley says that although the Fenchurch Street to Southend line was equipped with the warning type of automatic train control this could not have prevented the accident as it operated only at the distant signal. The equipment, which was of the Hudd type, was working correctly and it carried out the two-fold function of indicating to drivers the location of the distant signals and of giving them advance warning of their aspects. Brigadier Langley again does not recommend the adoption of a train stop, but states that when the colour light signals (now being installed in connection with the forthcoming electrification) are brought into use the conditions which contributed to this accident will no longer exist.

AUSTRALIAN NEWS

From a Correspondent

DURING 1956-57 the N.S.W. Commission's sales of electricity amounted to 5,143 million kWh, 13 per cent more than in the previous year. The Commission finished the year with a surplus of £144,816 from an income of £39,066,295. The Commission's customers benefited from savings in fuel costs resulting from the establishment of power stations in the coalfields. A total of 229 MW of new generating plant was added to the system, bringing the effective capacity to 1,489 MW at the end of the year. The transmission network was increased by 147 miles of 132 kV lines and 95 miles of 66 kV lines. The first section of the 330 kV line extending from Dapto to Goulburn was also completed. Seven new substations for bulk supply were brought into service and the capacity of existing substations was greatly increased.

The Electricity Commission has completed a new power station at Bourke and has announced plans for widespread western extensions of its system. From the Queensland border to the Murray Valley, the new extensions will replace isolated town supplies and promote the electrification and development of the inland areas. The Commission is proceeding with the construction of a 132 kV transmission line between Orange and Dubbo to meet growing power demands in the west. A contract for the erection of the 85-mile line has been let to the Electric Power Transmission Co. and the work is expected to be completed by the end of this year. The line will be operated initially at 66 kV. The estimated cost is £300,000. The system has recently been extended from Narromine to Nyngan and a survey for a further extension to Cobar will be carried out shortly. An extension from Dubbo to Coonamble is under construction. A major new line augmenting transmission capacity between Orange and Dubbo is necessary to keep up with the growing demands brought about by these westward extensions of the system.

While the current demand for both integral and fractional h.p. motors is well below the peak level of 1954-55, it is by no means unsatisfactory. There has been a continuing replacement of imported integral h.p. motors following advances in local production and capacity. Competition is keen but most manufacturers are confident that a satisfactory level of activity can be maintained for the rest of the year.

Expectations of manufacturers are for increased demand for most types of wires and cables. The swing continues towards the use of plastic-covered cables instead of the rubber and textile covered types. Demand is growing for winding wires and cables for television needs.

The demand for power transformers remains sluggish. Competition is keen and prices have been forced down, according to some manufacturers, close to uneconomic levels. Many manufacturers believe that standardisation of transformer requirements on a nation-wide basis is the only way in which further savings in manufacturing costs could be made.

The electrical control gear industry's production is high at present, but many manufacturers are concerned at the falling off in orders.

PARLIAMENTARY REPORT

Railway Electrification Progress

In a debate on the British Transport Commission's activities, Mr. Watkinson, Minister of Transport, said that another 90 main line diesel locomotives for delivery in 1959 were being ordered, in addition to the 200 already due to be delivered in that year. This would not be at the expense of the great electrification programme in which the real future lay. Diesels were the interim phase.

In the Styal section, between Manchester and Crewe, the overhead equipment was complete and testing would start very shortly on the 25 kV system. Stage 2 of the Crewe-Liverpool section was now being surveyed and the many suburban electrification programmes were ahead of schedule.

Commonwealth Development

Opening a debate on Commonwealth trade and economic aid, Mr. Callaghan said that many development projects were being held up through lack of capital. He suggested the setting up of a Commission for Commonwealth Development. It had been suggested, he said, that if we were to support hydro-electric schemes in India we could only do it at the price of cutting down expenditure on the modernisation of our own railways. There were various great schemes outstanding in the Commonwealth, such as the Volta River development, that were held up for shortage of capital. There was no machinery or joint responsibility for examining the various schemes and trying to fix the order of priority.

Mr. Vaughan-Morgan, Minister of State, Board of Trade, said that the Government were trying to devise new ways of giving capital assistance to the Commonwealth countries and increasing trade, and there would be a full opportunity for discussing them at the Commonwealth Economic Conference in Montreal in September. The Government were giving careful consideration to India's difficulties and wished to see what they could do to assist her.

Fluctuations in the prices of raw materials created complex difficulties. In September the Government would take part in discussions through the Commission for International Commodity Trade on copper, lead and zinc, which recently had been the hardest hit. It was hoped to arrange stabilisation agreements. Many factors made it difficult to work out a stabilisation scheme for rubber.

Mr. Albu thought the Commonwealth had not devoted enough attention to research into sources of power, on which some interesting papers had been written by Dr. Golding of the Electrical Research Association. One of them concerned Somaliland, where he (Mr. Albu) would have thought power resources would be difficult to develop. There were, however, all sorts of ways. These included wind power, solar power, local sources of fuel burnt in the type of small engine developed by Dr. Ricardo for India and small local hydro-power stations.

Graduates and National Service

In an adjournment debate Mr. Eric Johnson called attention to the need for men with third-class honours degrees in physics and mathematics to have deferment from national service so that they could take up teaching appointments. It was strange, he said, that a man with an ordinary degree in science, which would often include mathematics as a main subject, had indefinite deferment, whereas a man with a higher standard of third-class honours in mathematics was not.

Mr. William Hannan complained that it was not logical for third-class honours graduates in mathematics and science to be exempt if they entered jobs approved by the Minister of Labour, but not exempt if they were becoming teachers. It was putting the cart before the horse.

Mr. Richard Wood, Parliamentary Secretary, Ministry of Labour, said the illogicality arose from the way the deferment scheme had developed. By 1953 all science and engineering graduates could be deferred for defence projects and work connected with atomic energy, but the question of deferment of teachers was not raised at all until 1956. By that time the number of deferments was so large that the deferment for teaching could not be made available to all science graduates.

The Government were conscious of the great difficulties which the schools were having in trying to get science and mathematics teachers, and they had made considerable concessions every year. Three hundred graduates were deferred last year for school teaching and there were likely to be 400 in 1958. "If we make it easier for the teaching profession, we make it at the same time harder for defence projects, industry, nuclear power and the services," said the Minister.

Trolley-bus Services

Replying to Lord Merrivale, Lord Mancroft, Minister without Portfolio, said that trolley-bus services had been deliberately excluded from the licensing provisions of the Road Traffic Act because the equipment and operation of such routes required the installation of apparatus in the streets and generally affected the ordinary citizen and public bodies more than other bus services. The Government believed that it was fitting that the present rule that trolley-bus routes should be approved by Parliament by means of a Bill or an Order should continue.

Lord Merrivale said that at present only 30 undertakings operated trolley vehicles, and nine of them had notified their intention to reduce or withdraw them. "Is this in keeping with the national interest," he asked, "having regard to the load factor which is a desirable feature of the atomic power stations, and from the point of view that trolley vehicles use home-produced fuel?"

Lord Mancroft said he knew these facts, but the essential point was that trolley-buses were being reduced substantially; generally it was considered that the disadvantages of the trolley-bus outweighed its advantages.

Proposed New Tube Line

Replying to Mr. E. Davies, the Minister of Transport (Mr. Watkinson) said it had not yet been possible to allocate to the Victoria tube railway project any of the capital available to the Commission. The line would be costly to construct and had no prospect of paying its way. It would, however, make a valuable contribution to London travel, and he intended to keep the project under review with the Commission with the object of including it in their programme as soon as resources permitted.

Automatic Telex Exchanges

Mr. Marples announced that the first two automatic telex exchanges would be opened in the autumn of this year. One would be in Shoreditch, serving about one-third of the telex subscribers in London, and the other in Leeds, serving telex subscribers there and in Bradford, Lincoln, Middlesbrough and York. The telex service would be completely automatic in three years. Operating economies so achieved would enable the Post Office to introduce a new tariff, based on the same principles as the new telephone tariff recently announced. There would be a 2d unit charge for telex calls, the amount of time bought for 2d depending on the distance of the call.

London Electricity Board Inquiry

In a written reply to a Parliamentary question by Mr. Farey-Jones, Sir Ian Horobin, Parliamentary Secretary, Ministry of Power, stated that in response to the request of the London Electricity Board the Minister had requested Mr. Henry Benson, of Cooper Bros. & Co., chartered accountants, to carry out an inquiry into the methods adopted by the London Electricity Board for the disposal of scrap cable, and into "allegations made concerning this matter."

VIEWS on the NEWS

By REFLECTOR

A CORRESPONDENT spending a holiday in a small Cornish fishing village says that a replacement electric lamp was needed for the cottage in which he is staying. He looked around for an electrical shop but was not surprised to find that there wasn't one. He asked the greengrocer where a lamp could be obtained and was told that lamps were stocked by the baker and the hairdresser. As the baker's shop was the nearer he called there and found a small pile of lamps under the shelves of canned comestibles. Now "legitimate" dealers complain of the indiscriminate supply of lamps to all kinds of people but surely they could have no objection in this instance. I wonder, however, whether this village has one of those strange combinations such as "baker and electrical engineer" which I occasionally come across.

* * *

A strange case in which the election of a candidate to the State Legislature depended on the definition of electricity is reported from Madras. The defeated candidate, it appears, brought a petition challenging the election of the winner because of his position with certain electricity supply companies. It was contended, *inter alia*, that he thereby had an interest in contracts for the supply of goods to the Government and was disqualified under the Representation of the People Act, 1951. This raised the question of whether electricity was "goods." Counsel for the respondent drew attention to the fact that Chalmers in his "Sale of Goods Act," had expressed a doubt whether gas, water and electricity might be regarded as goods. Meares' "Law Relating to Electrical Energy in India and Burma" and a 1909 case in the King's Bench Division, County of Durham Electric Power Distribution Company *v.* Inland Revenue Commissioners, were also cited on this point. The tribunal's finding, therefore, was that "the supply of electrical energy to consumers cannot be equated to the supply of goods."

* * *

Last week the hope was expressed by a spokesman of the United Kingdom Atomic Energy Authority that an improved form of ZETA, the fusion reactor, would be in operation next year. Sir Claude Gibb, speaking at Newcastle the day before, affirmed his intention of going ahead with the Calder Hall (fission) type of nuclear plant. Sir Claude told the North East Industrial and Development Association that three years ago all those concerned with these developments were quite certain that with enriched fuel they could have designed and built better and cheaper nuclear stations. Since then so rapid had been the advance in the design of the straight uranium plant that we were building better, safer and more economic stations than enriched fuel could provide. Sir Claude stated that to consider building oil-fired power stations, dependent upon precarious supplies from overseas, was "national suicide." He also said that he preferred to stick to the reality of nuclear fission rather than await the realisation of practicable nuclear fusion which might come about in twenty-five years' time. I think there is no doubt that Sir Claude and the other industrial leaders in this field have made the right decision, a decision which has given this country a substantial lead.

* * *

I commented recently upon the indignation of some Midlands Electricity Board customers at being charged an extra halfpenny in their quarterly accounts. The Board's explanation was that its electronic accounting system could not deal with halfpennies but I suggested that it would avoid a lot of trouble if it could adjust its machinery to charge a halfpenny less, rather than more, in the accounts. I am glad to see that my advice is being taken although I am sorry to learn that the man who took the lead in the consumers' protest is said by the *Birmingham Evening Despatch* to be in hospital recovering from a collapse. The *Despatch* estimates the cost of the charge to the Board at "thousands of pounds a year"—a nicely-vague figure. The Board has about 1,400,000 consumers. Assuming that they all have quarterly accounts (which they do not) and all these accounts work out at an odd halfpenny (which is unlikely) I calculate that the annual cost to the Board would be about £11,660. It will actually be about half this figure I should imagine.

* * *

"Changes at the Vicarage" was the subject of a recent short article in *The Times*. The correspondent described the vicarage as "odd-looking without and inconvenient within" with plumbing and electricity tacked on in a haphazard way. There was a time when the faint but persistent smell of gas baffled the occupants "and what unholy glee was shown by the gas fitter who discovered at last that it was an electrician who had replaced a floor board with a nail through a gas pipe." Not merely a gassed but, apparently, a gasified electrician.

* * *

Congestion on London's underground railways is not a modern phenomenon. Seventy years ago the *Electrical Review* (3rd August, 1888) published the following note:

"The *St. James's Gazette* thinks that the long looked for improvement of the atmosphere of the Underground Railway seems at last to be within measurable distance. According to a statement made by Sir E. Watkin at the meeting of the Metropolitan Railway, a locomotive engine to be worked by electricity is in process of construction. Every traveller by the railway, remarks our contemporary, will await with interest the result of the experiment, which, however, if it succeeds, will not quite remedy existing evils. Locomotives worked by electricity will not relieve the sense of suffocation experienced in a carriage crammed with more passengers than it was made to hold. The overcrowding on the underground lines is constant and excessive."

INDUSTRIAL NEWS

Accommodation at Torquay

Mr. J. W. Simpson, secretary of the British Electrical Power Convention, asks us to say that all delegates to the Convention are responsible for securing their own hotel accommodation, although the Convention secretariat will be pleased to help where difficulty is encountered.

Further assistance can be obtained from the director of publicity, Torquay, or from Mr. P. G. Rayment, secretary, Torquay Hotel Association, 9, Vaughan Parade, Torquay.

Next year's Convention is being held during the week beginning 1st June.

Metal Spraying Conference

In view of the success of the first International Metal Spraying Conference in Halle, Eastern Germany, in 1956, it has been decided to hold a second one in Birmingham from 29th September to 3rd October, the arrangements being undertaken by the Association of Metal Sprayers. Lectures and discussions will take place at the new College of Technology, Gosta Green, Birmingham, and the programme includes practical demonstrations and works visits. Papers submitted by experts from all over the world include the following subjects: Building up and hard surfacing; diffused coatings; use of high melting point metals, e.g., tungsten and molybdenum; mechanical and chemical properties of deposits; linings for antifriction bearings; and electric arc spraying. The proceedings will be transmitted simultaneously in French, German and English by means of an internal radio-telephone installation. Programmes and forms of application for registration can be obtained from the Association of Metal Sprayers, Barclays Bank Chambers, Dudley, Worcs.

230 V Electric Fence

At the Sussex Assizes, Lewes, on 25th July Rudolf Ludwick Waliczek, a Polish radio and television engineer, was fined £50, with the alternative of nine months' imprisonment, for the manslaughter of a 14-year-old boy.

It was stated in evidence that the defendant, to protect a hut in which he did his work, erected a wire fence and electrified it. At first he tried 110 V but found that it was ineffective. Consequently he raised the voltage to 230 and he stated in court that on testing it he and a neighbour received shocks without ill-effect.

Mr. Justice Hinchcliffe accepted a statement by the defendant's counsel that Waliczek, in the defence of his property, had installed a system which he thought would cause merely temporary discomfort. In the circumstances, the Judge thought that he was justified in not sending the defendant to prison.

Football Ground Floodlighting

The floodlighting installation of Aston Villa Football Club's ground, Birmingham, is now nearing completion. The installation, which has been carried out by the staff of the Sutton and N.E. Birmingham District of the Midlands Electricity Board (manager, Mr. H. Watson), is mounted on four tubular steel towers, each 155ft 10in high and each topped by a bank of forty-eight 1,500 W floodlamps. Lighting experts from the General Electric Co., Ltd., which has supplied the lamps, will shortly be conducting focusing tests. The official switch-on will be carried out by the Aston Villa Club's chairman, Mr. C. S. Buckley, and is expected to take place on 8th September. To guard against a failure of electricity supplies during play there is an alternative feed. The main supply is by an 11 kV cable to a new substation in a subway beside the Club offices. The alternative feed is via a medium voltage cable from Aston Park substation. Switchgear is incorporated so that if the main supply fails the load is automatically carried from the secondary source. There is also a system by which the lights can be remotely controlled from the directors' room. The total load of the installation is 450 kW and the layout of the substation has been designed to provide for any future load, such as soil-warming cables beneath the pitch.

Battery Equipment for Hams Hall

Two stand-by stationary batteries, each consisting of 205 heavy duty low resistance "Nife" cells, together with automatic charging equipment, have been supplied by Nife Batteries, Ltd., of Redditch, for Hams Hall "C" power station at Birmingham. One battery has a capacity of 60 Ah at the 5-hour rate of discharge and is required, in the event of a mains failure, to supply current for switch closing and auxiliary circuits. The other battery has a capacity of 275 Ah at the 5-hour rate of discharge and will be used to operate the emergency oil pump motors and provide an emergency lighting load of 24 kW for one hour.

New Extrusion Machine Company

A company has recently been formed under the title of Jennings Engineering (Great Britain), Ltd., at 17, Stratton Street, London, W.1, to manufacture and sell a range of extruders for p.t.f.e. (polytetrafluoroethylene). The shares in this company are held as to 75 per cent by Jennings Machine Corporation of Philadelphia, United States, and 25 per cent by Stratton Chemicals, Ltd., of London.

The Jennings Machine Corporation has developed and marketed for some time in the United States p.t.f.e. extruders covering thin-wall electrical cable coverings, "spaghetti" electrical sleevings, thin-wall tubings, etc., from dispersion grade polymers, and rod and heavy-wall tubings from granular polymers.

A manufacturing licence arrangement has been entered into with the Havelock Engineering Co., Ltd., of Harlow, whereby that company will carry out the actual manufacture and technical service of these machines on behalf of Jennings Engineering (Great Britain), Ltd., who are handling sales. It is intended that sales of United Kingdom produced machines should be extended later to various European and Commonwealth markets.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £203 15s 0d
Fire Refined 99·70%	ton £202 0s 0d
Fire Refined 99·50%	ton £201 0s 0d
COPPER Tubes ..	lb 1s 11½d
Sheet	ton £230 5s 0d
H.C. wire and strip ..	ton £253 5s 0d
LEAD, English ..	ton £70 5s 0d
Foreign	ton £69 0s 0d
MERCURY	flask £79 0s 0d
TIN, block (English) ..	ton £731 15s 0d
ZINC, G.O.B. Foreign	ton £64 0s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 7½d
Sheet	ton —
Wire	lb 2s 5d
PHOSPHOR BRONZE Wire	lb 3s 9d
PLATINUM	oz £23 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 23¼d-23½d

Index of Retail Prices

At mid-June the official retail price index figure (January, 1956=100) was 110·2.

Examination of Steam Boilers in Industry

The Advisory Committee on the Examination of Steam Boilers in Industry which, as announced by Mr. Iain Macleod, Minister of Labour and National Service, in the House of Commons on 22nd May, has been set up under the chairmanship of Mr. G. G. Honeyman, C.B.E., Q.C., has decided to invite evidence from interested individuals and organisations.

The Committee wants evidence on

all matters falling within its terms of reference, which are "to consider the existing legal provisions concerning the examination of steam boilers in the light of modern developments in design and construction, the size of the units installed and the use of nuclear reactors as a source of heat; and to advise the Minister of any changes which appear desirable."

Persons or organisations wishing to give evidence are asked to communicate with Mr. J. L. B. Garcia, secretary of the Committee, at the Ministry of Labour and National Service, 19, St. James's Square, London, S.W.1.

Precipitators for West Thurrock Power Station

W. C. Holmes & Co., Ltd., Huddersfield, have received an order from Babcock & Wilcox, Ltd., for two "Holmes-Elex" electrical precipitators to be installed with the two 200 MW re-heat boilers, with pulverised fuel firing, at the West Thurrock power station of the Central Electricity Generating Board.

Royal Lancashire Show

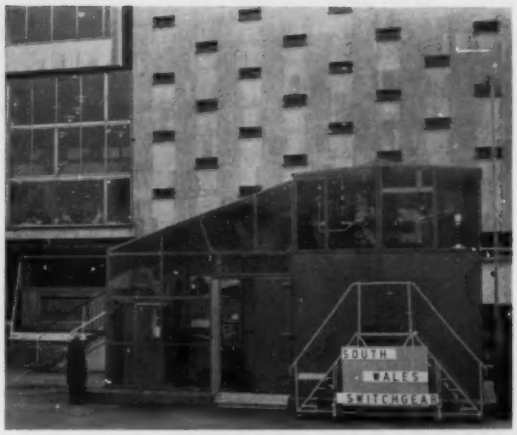
The stand of the North Western Electricity Board at the Royal Lancashire Agricultural Show, Blackpool, which opened on Tuesday last, in addition to displaying general examples of electricity applied to farming, has an agricultural section showing a mammoth brooder, catering for 1,000 day-old chicks, "Do It Yourself" multi-purpose crop drying units developed by the Board, deep freeze for the storing of farming produce, and the drying of hay in bale by electricity. On the horticultural side electrical methods of producing early crops of tomatoes are shown, including a giant tomato plant. The show ends to-day (Friday).

Tabulating Machine Company's Jubilee

The British Tabulating Machine Co., Ltd. (one of the Hollerith group of companies), this year celebrates its golden jubilee, and its external house journal, *The Tabulator*, attains its majority.

Safety of Lifting Appliances

The Minister of Labour and National Service has published statutory draft regulations (Building (Safety, Health and Welfare) (Amendment) Regulations, 1958, H.M. Stationery Office, 4d net, 6d post free) amending certain regulations in the existing Building (Safety, Health and Welfare) Regulations, 1948. The draft regulations are designed to secure improved standards of safety in the operation of lifting appliances. They relate to lifting appliances which form the subject matter of Part IIIA of the Building (Safety, Health and Welfare) Regulations, 1948, and will amend the requirements relating to derrick cranes, including rail-mounted tower derrick cranes. The draft regulations will also impose additional requirements affecting the stability and use of lifting appliances, the communication of audible and visible signals relating to the safe loading of lifting appliances, and requirements as to the safe working loads of cranes with variable operating radii. The publication of the statutory draft provides an opportunity for organisations and individuals concerned to consider the requirements and to raise any points they may have with the Ministry. Representations should be addressed to the Secretary, Ministry of Labour and National Service, 8, St. James's Square, S.W.1, by 22nd August.



South Wales Switchgear package switching station on show in front of the Royal Festival Hall

Colombian Credit Insurance Cover

The Export Credits Guarantee Department is notifying policy holders that cover for business with Colombia is once more available. Although Colombia's payments position is still difficult, there has been some improvement recently, and E.C.G.D. considers that a basis for cover once more exists.

Argentine Government Buys German Plant

Reuter reported last week that the Argentine Government had bought the former German-owned plant of Allgemeine Electricitäts Gesellschaft (A.E.G.) for 30,400,000 pesos (about £250,000). The plant was confiscated during the last war and the purchase followed an agreement with Western Germany for the liquidation and auction of former German assets in State hands.

No bids were entered for two smaller former German plants, Cesia and Roberto Bosch, both manufacturing electrical equipment, which were offered for 3,300,000 pesos (about £25,000 sterling) and 1,200,000 pesos (about £9,000 sterling), respectively. Both plants will be put up for auction again within 90 days at a lower price.

Package Substations

The success of the 33 kV outdoor metalclad package type unit manufactured by South Wales Switchgear, Ltd., has now prompted the company to take a further important step in the design of completely outdoor factory-built substations. This consists of an annexe built on to the front of the 33 kV metalclad unit to provide housing for the 11 kV switchgear in a step-down station and also ancillary equipment.

The accompanying illustration is of a single unit which has been on exhibition for the past week at the South Bank site in London. This has been arranged as a cut-away exhibition with "Perspex" side sheets to show the internal construction. In the top right-hand section are shown the feeder and busbar compartments of the 33 kV switchgear, whilst in the bottom left-hand corner the 11 kV indoor type switchboard can be seen.

The fact that the whole substation is factory built and sent to site in sections means the complete elimination of civil work, except for the preparation of a relatively simple concrete base.

The substation is supplied complete with internal lighting and heating equipment and is arranged with a central aisle with a doorway at each end. This central aisle provides a common withdrawal space for both 33 kV and 11 kV circuit-breakers.

Canadian Company's New Premises

E.C.C. Canada, Ltd., has recently moved to new premises at 66, Colville Road, Toronto, 15. The company is responsible for the consultation, sales and distribution services of the products of its English principals, the Electric Construction Co., Ltd., and George Ellison, Ltd.

Courses in Electrical Machines

The Electrical Engineering Department of Imperial College, London University, is organising two vacation courses this summer. The first, from 1st to 19th September, on "Limiting Physical Phenomena in Electrical Machines," is designed to meet the needs of graduates in electrical engineering who are engaged in development work on electrical machines, and will deal mainly with magnetic phenomena, energy losses, heat transfer and commutation. The second, from 22nd to 27th September,

on "Generalised Theory of Electrical Machines," provides an introduction to the general differential equations of electrical machines and their application to practical problems. Further particulars can be obtained from the Deputy Registrar, City and Guilds College, London, S.W.7.

Switchgear for South Africa

Crompton Parkinson, Ltd., has received two orders from South Africa, one from the Port Elizabeth Municipality and the other from Durban Corporation, for switchgear to the value of £100,000. The Port Elizabeth order includes eight 66 kV outdoor oil circuit-breakers with associated voltage transformers and control panels for the switchyard at Swartkops power station. The circuit-breakers are of 2,500 MVA breaking capacity and will be manufactured at Manchester by Cooke & Ferguson, Ltd., a subsidiary company of Crompton Parkinson.

Twelve 33 kV metalclad switchboard units of 1,000 MVA capacity are included in the Durban order, the complete switchboard being arranged in two halves interconnected by busbar cables. The switchgear is of the duplicate busbar fully phased segregated type with bus zone protective gear and this equipment will be manufactured by Cooke & Ferguson. Crompton Parkinson's South African agents, Arthur Trevor Williams (Pty.), Ltd., will supply the steelwork and busbars for the Port Elizabeth installation and also erect the whole equipment at both Durban and Port Elizabeth.

London Heating Centre

Mr. A. C. Hazel, managing director of the Hurseal Heating Group, speaking recently at the inauguration of the new Heating Centre and permanent exhibition of heating at 229, Regent Street, London, said that he hoped the new Centre, which was a co-operative effort by the Hurseal Heating Group, the Esso Petroleum Co., Ltd., the Rheostatic Co., Ltd., the Isocrete Co., Ltd., and the Marley Tile Co., Ltd., would prove of value both to the public and all concerned in the provision of heating.

Factory Accidents

The whole of the July issue of the H.M. Factory Inspectorate publication, "Accidents" (H.M. Stationery Office, price 1s 3d), is devoted to those accidents which can be attributed to the lack of proper maintenance of plant and machinery. The frequent examination of a piece of plant, a machine or a building is an essential part of its proper maintenance. The neglect of hand tools is notorious. About 8 per cent of all reportable accidents are due to the use of hand tools and in many cases they are the direct result of bad maintenance. Other examples of faulty maintenance given in the booklet include flameproof lighting fittings, low voltage equipment, junction boxes, earth leads and broken switch contacts.

Festival of Industrial Films

At a recent meeting of representatives of all the organisations who served on the Council of the first Festival of Films in the Service of Industry it was decided to organise a second festival, to be held in Harrogate from 21st to 24th April next year. Lord Godber has consented to be the President of the Festival.

English Electric Window Display Competition

Details of the 1958 window display competition sponsored by the English Electric Co.'s domestic appliance division are now being sent to Electricity Board showrooms and authorised dealers. The new competition will be held during the autumn for the seven weeks from 8th September to 25th October, and cash prizes totalling £500 will be awarded for the most original and effective displays. Competing window designs, which must be based exclusively on appliances from the English Electric range, may include crowners and showcards issued by the company, and additional display material created by the competitors from their own resources. Displays must remain in position for a minimum of any two consecutive weeks during the period.

The new Heating Centre which has recently been opened in Regent Street, London

Preliminary judging will be done by the domestic appliance division's area managers throughout the United Kingdom, who will short-list eight displays in each area. Photographs of these windows will be sent to the judges' panel in London. The prizes are divided into two sections, one for entries from service centres and the second for dealers, each section having a 1st prize of £100, a 2nd prize of £60 and a 3rd prize of £30, and twenty-four "special mention" prizes of £5 each will be awarded. Judges of the finalists will be Mr. H. C. Timewell (English Electric Co., Ltd.), Mr. C. T. M. Bagnall (publicity manager, English Electric Co., Ltd.), Mr. F. A. Nicholson (managing director, Legget Nicholson & Partners, Ltd.), Mr. A. Smith, F.S.I.A. (display designer) and Miss Helen Burke (journalist).

Kuwait International Airport

Shaikh Fahad as-Salim As-Sabah, president of the Development Board and Public Works Department of the Government of Kuwait, has appointed Frederick S. Snow and Partners as consulting engineers for the development of the new Kuwait International Airport under the direction of Fuad Abdel-Baki, Inspector-General of the Public Works Department. Construction is expected to commence in 18 months' time.

Works Visit

On 18th July a party of German Government officials, industrialists and scientists visited the site of Bradwell nuclear power station as the guests of the Nuclear Power Plant Co., Ltd. After a tour of the reactor buildings and turbine house, the delegation was entertained to lunch at the Bradwell Ranch by Mr. A. Young, chief resident engineer.

Yorkshire Switchgear Acquisition

The Yorkshire Switchgear & Engineering Co., Ltd., has purchased the whole of the issued share capital of the Electro Mechanical Manufacturing Co., Ltd., which now becomes a wholly owned subsidiary. The two companies have worked in close association since the Electro Mechanical Manufacturing Co. was formed in 1943 and in the main will continue to operate as separate organisations within their individual sphere of interest in the switchgear industry. Mr. G. Caton, M.I.E.E., has been appointed chairman of both companies, continuing also as managing director of the Yorkshire Switchgear & Engineering Co., Ltd.

Clean Air Jubilee

The National Society for Clean Air announces that the Duke of Edinburgh has consented to be Patron of the International Clean Air Conference and Exhibition to be held in October, 1959, to mark the diamond jubilee of the Society and of the clean air movement in this country. The president of the Society and of the conference will be Sir Hugh Beaver. The conference will deal with legislation and its administration, education and public opinion, international co-operation and information exchange, research and

investigation, and technical questions of world-wide concern, such as pollution from road traffic and airborne radioactive material. The exhibition to be held in conjunction with the conference (both will be at the Seymour Hall, London, W.1) will be largely of a technical and educational nature.

Elbourne Memorial Lecture

The Earl of Verulam, J.P., chairman of the British Institute of Management, has chosen the title "The Great Tomorrow" for the fourth Elbourne Memorial Lecture which he will be delivering on 3rd October. The lecture was inaugurated in 1955 by the Institute of Industrial Administration—integrated with the B.I.M. in 1957—in memory of Edward T. Elbourne, who founded the I.I.A. in 1920.

Metal Prices Chart

From Messrs. Vivian, Younger & Bond, Ltd., Princes House, 95, Gresham Street, London, E.C.2, we have received a copy of their metal prices chart. This useful publication gives in graph form the average prices of copper, lead, zinc and tin for each month of the twenty years to 1957 with incidental information. Copies are obtainable at 10s 6d inland and £1 1s overseas.

Capenhurst Nearing Limit ?

Mr. W. R. A. Taylor, deputy works manager of the Capenhurst factory of the United Kingdom Atomic Energy Authority, is reported by the *Manchester Guardian* to have told a meeting at Chester last week that the expansion which had been proceeding at Capenhurst was not expected to continue after next year. He said that the factory was the largest single consumer of electricity in the country and its expansion would cease because "it would be difficult to bring in any more electricity."

Conservation of Beryllium

The Australian Government, which already restricts the export of beryllium ores and concentrates and grants licences only for shipment to the United Kingdom, has decided to "stockpile" beryl ore in anticipation of an increased demand. Beryllium is used for the "canning" of uranium fuel elements and as a moderator in nuclear reactors.

Lincoln Wholesalers' New Premises

The new Lincoln branch premises of Gothic Electrical Supplies, Ltd., at Bracebridge Hall, Newark Road, Lincoln, were formally opened recently by Mrs. Hughes, wife of Mr. H. N. Hughes (chairman and managing director), in the presence of manufacturers, suppliers and guests from all parts of the country. The premises are imposing buildings in their own grounds facing on to the main road with car park facilities for 150 vehicles. Extensive internal structural alterations have been carried out but the character and beauty of the Hall, which was built some eighty years ago, have been retained. The Gothic Electrical Supplies, Ltd., commenced operations in Lincoln in 1940 at Melville Street, and with the post-war expansion larger premises became necessary. Bracebridge Hall will enable the company to supply a complete range of electrical, refrigeration, radio and television equipment throughout Lincolnshire and adjoining counties. The company's head office is at Gothic House, Henrietta Street, Birmingham.

Bracebridge Hall, the new Lincoln premises of Gothic Electrical Supplies, Ltd.

Change of Name

Alar, Ltd., has formed a combined organisation with the Federation of Light Metal Smelters. The name of the new body is the Association of Light Alloy Refiners and Smelters. The free technical advisory service will continue to be operated from 3, Albemarle Street, London, W.1.

Educational

A course of six lectures on electronic switching will be held at the South-East London Technical College, Lewisham Way, S.E.4, on Tuesday evenings, commencing on 21st October. Particulars can be obtained from the Head of the Department of Electrical Engineering and Applied Physics at the College.

Trade Announcements

The new works and offices of the **Palnut Co., Ltd.,** at 3, Arthur Street, Hove, Sussex, are in the final stages of completion, and the company will be operating from that address as from 5th August.

With effect from 11th August the address of the Nottingham Branch of **Crompton Parkinson, Ltd.,** will be Crompton House, Maiden Lane, Woolpack Lane, Nottingham (telephone: Nottingham 45678).

The **Electrical Equipment Co. (Leicester), Ltd.,** has reorganised its export sales distribution, in conjunction with BOECC, Ltd., of 39, Victoria Street, London, S.W.1, from which address its export sales are now being conducted.

Easco Electrical (Holdings), Ltd., announces that under an agreement reached between the company and Plessey International, Ltd., the latter now has the exclusive handling of all overseas sales and inquiries for "Eascolyte" low voltage fluorescent lighting equipment. Developed jointly by Easco and the Plessey Co., Ltd., the equipment will continue to be marketed by Easco in the United Kingdom.

The new factory of **Plannair, Ltd.,** now under construction at Leatherhead, Surrey, which will be completed in October next, will add 15,000 sq ft to the company's existing capacity. The new premises will incorporate research laboratories. Plans are also in hand for adding a further 4,000 sq ft, which will include additional factory space and administrative offices. When in full production by mid-1959, the factory will treble Plannair's existing output.

Opperman Gears, Ltd., Newbury, has transferred its northern area office from Leeds to 20, St. Ann's Square, Manchester, 2 (telephone: Blackfriars 6451), under the supervision of Mr. M. G. Marsh.

Barlow-Whitney, Ltd., ask us to remind readers that the telephone number of their Neasden Works is now Dollis Hill 6616.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 9th August:—

FERRANTI. No. 768,154. Class 7. Electric motors (not for land vehicles); electric generators; and machine tools incorporating electrical automatic control apparatus; and parts.—Ferranti, Ltd., Wickentree Lane, Hollinwood, Lancs.

AMPOMATOR. No. 776,162. Class 7. Machines for applying or fitting terminals or connectors to cables or wires, and parts.—Amp Inc., Harrisburg, Penn., U.S.A. Address for service, c/o Urquhart-Dykes & Lord, Maxwell House, 11, Arundel Street, Strand, London, W.C.2.

TRANSISPHONE. No. 772,609. Class 9. Telephonic apparatus.—Lustraphone, Ltd., St. George's Works, Regent's Park Road, London, N.W.1.

SIELINE. No. 775,146. Class 9. Electrical apparatus and instruments and parts.—Siemens Edison Swan, Ltd., Caxton House, Tothill Street, Westminster, London, S.W.1.

OVERSEAS ELECTRICAL TRADE

Fall in Exports for First Six Months

THE figures of British electrical exports in June do not make such good reading as they have done for a long time past. The total for the month of £15,124,188 was £4·2 million below the May figure and £4·5 million lower than that for June, 1957. The reduced total in June has brought the total for the first half of this year (£111·6 million) to £3·7 million below that for the corresponding period of 1957. It must be borne in mind, however, that the recent London dock strike has had a considerable effect upon shipments, and the actual fall (if any) in overseas demand cannot therefore be gauged accurately. Practically all the main categories of electrical goods suffered last month, generating sets, motors, etc., at £2,435,630 showing a decrease in value of £1·5 million as compared with May and nearly £1 million when compared with June last year. The six months' total, however, is still over £2 million better than that for January-June, 1957. Similarly, the converting machinery,

TABLE I.—ELECTRICAL EXPORTS

Class	Month of June, 1958	Six months ended 30th June, 1957	Six months ended 30th June, 1958
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	79,107	903,418	757,887
Ditto, 10 to 65 kW	187,812	959,189	1,126,180
Ditto, 65 to 200 kW	106,836	762,021	1,113,254
Ditto, over 200 kW	192,505	2,101,587	2,332,221
Spark ignition engine driven	15,475	105,388	94,500
Steam turbine driven	47,898	263,431	428,078
Hydraulic turbine driven	—	—	—
Other prime mover driven	4,461	178,508	76,165
Generators, not exceeding 200 kW	113,793	938,328	780,682
Ditto, over 200 kW	167,537	652,376	592,706
Parts of generators	557,709	2,380,776	4,747,718
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	118,491	1,178,039	925,256
Over ½ but under 1 h.p.	29,610	278,354	319,051
1 h.p. to 250 h.p.	386,161	2,919,753	2,876,306
Over 250 h.p.	127,671	706,344	662,514
Railway, tramway and trolley-bus motors complete and parts of all motors	149,767	1,203,189	1,354,672
Motor starting and controlling gear	150,797	1,895,100	1,544,791
	2,435,630	17,425,801	19,731,981
Converting machinery	47,877	365,135	206,258
Mercury-arc rectifiers	40,975	501,845	611,477
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	560,445	3,879,182	3,875,542
Over 7,500 kVA	651,492	1,272,374	2,531,634
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	270,311	1,958,746	2,425,388
Ditto, other	812,793	7,091,731	6,031,972
	2,383,893	15,069,013	15,682,271
Primary batteries:			
Lighting	55,106	595,406	509,094
Radio	276,848	1,600,465	1,747,863
Other	29,020	245,722	261,557
Parts (excl. carbons)	45,690	325,247	283,588
Lamps:			
Filament, exceeding 28 V	56,969	553,428	504,116
Ditto, under 28 V	23,162	184,432	165,864
Arc lamps and searchlights	17,402	85,264	113,894
Discharge lamps, fluorescent tubes, etc.	46,496	552,044	487,253
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	19,619	138,582	159,245
All other	310,467	1,781,296	2,011,290
Parts (excluding glass bulbs)	13,180	71,147	90,270
Radio and television transmitters	988	411,493	226,442
Commercial radio and radar equipment	876,164	7,455,936	6,927,888
Domestic radio receivers, mains	49,767	676,543	490,428
Ditto, battery	35,445	352,864	318,609
Ditto, other (incl. car)	10,393	165,854	131,887
Radiograms	14,588	167,178	195,945
Television sets	50,510	365,346	654,783
Public address equipment	61,907	572,148	586,507
Other radio and television apparatus, n.e.s.	39,930	279,016	191,116
Components and parts, n.e.s.	644,726	4,799,062	4,423,315
	2,127,684	17,236,465	16,415,725
Telegraph and telephone installations	508,393	4,196,279	4,564,451
Telephone instruments, separately consigned	139,251	975,153	1,111,468
Telegraph and telephone parts	517,856	4,914,347	4,306,501
Line apparatus for long distance communication	94,930	963,572	1,007,566
	1,260,430	11,049,351	10,989,986

Class	Month of June, 1958	Six months ended 30th June, 1957	Six months ended 30th June, 1958
	£	£	£
Cookers	69,094	403,830	332,955
Toasters	10,386	112,536	118,279
Other cooking apparatus	26,488	188,873	207,184
Parts and accessories	33,663	426,291	320,530
Space heating appliances	4,914	203,043	206,711
Water heating appliances	21,622	196,960	166,881
Other heating appliances	17,809	230,725	213,652
Parts and accessories	46,103	345,044	377,004
Irons	37,240	411,256	442,057
Arc welding equipment, a.c.	42,717	328,853	390,016
Ditto, d.c.	72,800	284,880	434,991
Resistance welding equipment	4,091	137,805	80,192
Electric furnace plant	67,977	554,152	501,491
Magnetos, ignition	10,014	175,792	91,857
Sparking plugs	75,410	966,598	851,985
Elec. appliances for aeroplanes, n.e.s.	203,248	1,608,507	1,586,007
Ditto, for motor vehicles, n.e.s.	270,434	2,189,937	2,312,386
Ditto, for cycles, n.e.s.	35,256	348,514	311,414
Signalling app. (incl. traffic signals)	82,216	715,792	863,396
Instruments, commercial	140,875	1,087,858	1,075,047
House service meters (including parts)	102,248	885,109	879,512
Electro-medical apparatus (not X-ray)	29,499	246,564	295,977
X-ray apparatus (excl. tubes and valves)	36,907	420,632	333,098
Vacuum tubes	42,766	272,675	296,720
Ceiling fans, complete	92,030	773,894	641,960
Desk fans, complete and parts of desk and ceiling fans	18,249	233,299	148,743
Vacuum cleaners	60,557	907,784	785,624
Floor polishers	26,566	507,868	385,260
Food mixers	46,222	273,793	321,449
Hair clippers and dry shavers	34,282	501,398	319,369
Other portable appliances	10,885	166,886	108,905
Parts	69,494	842,407	645,376
Portable elec. tools (not saws) and parts	134,306	1,322,460	1,285,474
Cables and wires:			
Telegraph and telephone, submarine	165	2,299,659	425,639
Ditto, other	457,203	5,885,859	3,295,465
Cotton, silk or art. silk insulated	26,192	229,037	275,898
Enamel, glass or asbestos insulated	98,813	601,636	480,189
Paper insulated	1,263,309	4,936,924	4,406,336
Rubber insulated	380,741	3,400,969	2,870,639
Thermoplastic insulated	131,223	1,100,952	1,178,470
Other	185,188	1,207,338	1,383,375
	2,542,834	19,662,374	14,316,011
Accumulators for motor vehicles	128,310	910,981	964,247
Ditto, traction	12,951	169,933	128,823
Ditto, radio and other portable	56,324	486,272	323,182
Ditto, other	25,444	187,511	157,933
Parts and accessories	60,225	511,937	637,970
Electric wiring accessories	182,208	287,080	958,119
Elec. porcelain, etc. (incl. insulators), n.e.s.	62,421	678,836	612,257
Insulating cloth and tape	35,704	361,575	283,345
Other insulating material	89,868	569,398	564,691
Permanent magnets	33,156	275,317	296,267
Radio, telegraph and telephone testing equipment, n.e.s.	45,443	401,908	379,024
Scientific elec. instruments (not telegraphic or telephonic):			
Time recorders and time switches, complete	22,750	69,627	182,111
Other	320,508	1,769,717	2,109,902
Electrical machinery, n.e.s.	55,292	454,084	444,475
Electrical apparatus and appliances, n.e.s.	716,052	5,291,233	5,055,174
TOTAL	15,124,188	115,282,436	111,638,225

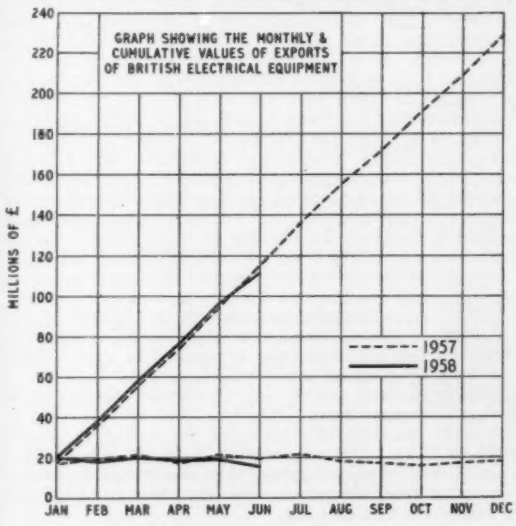
TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	Month of June, 1958	Six months ended 30th June, 1957	Six months ended 30th June, 1958	Country	Month of June, 1958	Six months ended 30th June, 1957	Six months ended 30th June, 1958
	£	£	£		£	£	£
Channel Islands	129,001	531,739	680,822	Netherlands	462,359	4,185,471	3,588,872
Gibraltar	5,902	111,815	199,198	Belgium	176,472	1,949,654	1,701,069
Malta and Gozo	59,987	346,882	441,174	France	200,725	2,355,234	2,062,094
Cyprus	52,956	776,540	494,250	Switzerland	111,793	731,690	913,758
Sierra Leone	40,236	212,186	348,501	Portugal	188,436	1,586,099	1,943,632
Ghana	220,129	1,104,238	965,753	Spain	183,083	2,267,178	1,030,086
Nigeria	397,514	1,687,850	2,191,596	Italy	199,650	1,847,965	1,679,528
Union of South Africa	1,087,996	8,874,326	9,789,478	Austria	27,616	242,143	256,438
Rhodesia and Nyasaland	460,463	3,033,245	2,655,960	Yugoslavia	14,718	278,903	292,332
Tanganyika	30,844	360,483	291,251	Greece	71,492	871,184	511,516
Kenya	98,866	1,563,244	798,481	Turkey	42,497	326,643	695,805
Uganda	50,296	610,934	383,781	Belgian Congo	15,976	281,704	211,379
Mauritius	52,845	194,993	249,494	Portuguese East Africa	21,862	176,598	145,020
Aden	34,596	279,413	330,832	Egypt	98,108	14,488	619,168
Bahrain, Qatar and Trucial States	62,557	917,535	516,714	Libya	39,408	223,891	326,355
Kuwait	102,604	1,629,594	947,413	Southern Morocco	16,656	215,618	185,985
India	1,343,925	12,452,715	9,261,517	Sudan	89,901	661,747	554,557
Pakistan	179,346	1,727,430	1,411,507	Syria	10,557	203,854	136,732
Singapore	209,158	2,186,883	1,903,582	Lebanon	33,068	209,120	324,236
Federation of Malaya	182,942	1,787,538	1,659,333	Israel	36,096	419,513	553,179
Ceylon	144,829	809,344	904,268	Jordan	46,411	387,982	452,512
British North Borneo	5,544	157,934	117,761	Saudi Arabia	84,371	333,243	490,099
Sarawak	19,045	163,478	126,868	Iraq	191,311	1,547,426	1,744,615
Hong Kong	183,351	1,407,092	1,731,507	Iran	260,767	2,049,932	2,112,116
Australia	804,064	10,091,522	9,332,633	Burma	62,911	470,438	404,726
New Zealand	952,651	5,391,101	6,882,502	Thailand	28,621	554,280	841,798
Fiji	16	109,558	124,636	Indonesia	2,149	340,619	176,974
Canada	1,708,126	6,391,871	7,066,154	Japan	75,356	515,977	311,026
Jamaica	106,831	581,341	808,489	United States of America	868,875	6,366,481	3,778,675
Barbados	12,016	116,884	150,840	Cuba	18,248	255,125	486,299
Trinidad	93,490	714,822	697,016	Mexico	26,389	314,170	297,743
British Guiana	188,256	236,223	458,568	Colombia	28,412	384,369	245,258
Other Commonwealth countries	63,889	644,634	969,378	Venezuela	170,990	1,602,147	2,127,795
Irish Republic	196,413	1,342,396	1,637,295	Peru	21,822	369,036	205,878
Soviet Union	15,783	1,167,396	248,617	Chile	35,622	250,769	222,749
Finland	83,874	852,740	767,159	Brazil	105,212	582,702	614,943
Sweden	517,546	2,221,750	2,784,593	Uruguay	2,530	128,038	15,269
Norway	162,144	1,282,683	1,242,492	Argentine Republic	173,857	671,601	1,868,813
Denmark	207,919	1,231,530	1,143,806	Other foreign countries	332,350	2,326,556	1,969,655
Poland	60,376	305,022	433,619				
Western Germany	219,085	1,172,944	1,590,703	TOTAL	15,124,188	115,282,436	111,638,225

mercury-arc rectifiers, transformers, etc., group showed a falling off of about £200,000 as compared with May and about £400,000 less than for June, 1957, but here also, the total for the first half of this year of £15·7 million is £600,000 higher than for the corresponding period of 1957.

In the other groups the six months' total is down when compared with last year, the radio and associated equipment group by about £800,000, the telegraph and telephone group by about £60,000 and cables and wires showing the biggest fall of £5·3 million.

Leading Commonwealth markets for generating sets, etc., in June were India, which took plant valued at £289,862, and Canada with purchases of £244,328. The best markets for converting machinery, etc., were South Africa (£331,082) and India (£326,916), and here also United States purchases advanced from £137,217 in May to £308,326 in June.



Although the demand for cables and wires during the six months showed a considerable falling off, the total for June was higher than for the preceding month, and this was largely accounted for by greatly increased exports to Canada which totalled £772,765 (against £125,863 in May and £93,068 in June, 1957). Supplies to the United States continued on a reduced scale. Details of the various classes of goods are shown in Table I, and their destinations are indicated in Table II.

Other types of electrical equipment shown elsewhere in the Board of Trade returns include the following:—

Electric locomotives: June, £187,190; six months (January-June), £1,538,597 (against £2,321,195).

Locomotives with i.c. engines and electrical transmission: June, £247,370; six months, £965,562 (£664,951).

Electrically-operated washing machines, complete, not exceeding 150 lb net weight: June, £260,491; six months, £2,396,084 (£1,777,948). Ditto, 150-250 lb: June, £71,224; six months, £485,904 (£617,195). Parts: June, £64,346; six months, £431,092 (£359,273).

Welding electrodes: June, £82,652; six months, £721,621 (£748,339).

Electric conduit tubes and cased tubes: June, £65,007; six months, £351,759 (£508,913).

Electric carbons (including parts): June, £49,483; six months, £312,511 (£339,647).

Electric lighting fittings and lanterns (excluding arc lamps, searchlights, and lamps for road vehicles): June, £196,683; six months, £1,684,407 (£1,251,082).

Other electric lighting appliances (excluding vacuum tubes and lamp bulbs) and fittings and parts, n.e.s.: June, £28,559; six months, £388,378 (£1,466,244).

Electrical imports in June amounted to £2,310,423, as compared with £2,486,081 in May and £1,894,693 in June, 1957. The total for the first six months of the year was £14,012,883 (against £12,743,398 for January-June, 1957).

Radio Research

THE report for 1957 of the Radio Research Board (whose chairman is Mr. O. W. Humphreys, C.B.E.) has just been published for the Department of Scientific and Industrial Research (H.M. Stationery Office, 3s 6d). An outstanding feature is a recommendation that the programme of the Radio Research Station at Slough should be generally broadened in scope to meet present and future demands. The proposals to this end include further development of measuring techniques of secondary standard calibre up to the highest radio frequencies; new investigations into the properties and applications of molecular amplifiers and oscillators; and basic research on the design and properties of microwave aerials and ways of transmitting information to achieve economy in the use of the radio-frequency spectrum. The Board advises that any subjects chosen for future study should be generic in scope and aimed at practical applications.

The Station has participated in the International Geophysical Year as one of the four world data centres, receiving information directly from over one hundred observing points, and exchanging this information with the corresponding data received by the other three centres.

Observations have been carried out on the radio transmissions from the first artificial earth satellites, and the signals have been particularly interesting as they come from sources travelling within and sometimes above the main regions of the ionosphere. The observations have included frequency measurements (Doppler effect) and determination of the apparent bearing and angle of elevation of the source. Detailed examination of the data will be facilitated when more accurate knowledge is available of the actual position of the satellites at the times of observation.

The report of the director of the Station (Dr. R. L. Smith-Rose, C.B.E.) includes a summary of the continuing investigations of the characteristics of radio wave propagation under various conditions for both long and short distances. This work includes the use of the back-scatter technique for which a new plan position indicator has been made for practical work. It is being operated on the three or four "Regular World Days" in each month which have been agreed internationally. Records are obtained, in the form of cinematograph films, of the plan position display photographed at the rate of one frame per minute. Work is also conducted in co-operation with the Ministry of Transport and Civil Aviation, which is undertaking operational trials to find out the usefulness of the technique in the civil aviation radio network.

Experiments have also been carried out on ionospheric forward scatter over large distances to find the angular distribution of the radiation arriving at the receiver. Corresponding investigations have been made at shorter wavelengths into the forward scattering of signals by way of the lower part of the atmosphere.

Investigations are also in progress at the Station and at Cambridge University of the propagation characteristics of radio waves at very low frequencies. At Slough, research effort is being concentrated on phase and amplitude measurements, while Cambridge scientists are studying observations at steep and oblique incidence.

B.E.A.M.A. Against Motorways Restrictions

A STRONG protest against the proposal that abnormal indivisible loads arising from industry should be barred from the new motorways was made last week by the British Electrical and Allied Manufacturers' Association.

In a letter to the Permanent Secretary to the Ministry of Transport and Civil Aviation, signed by the secretary of the Association, Mr. James Oldroyd, the view is expressed that the proposal does not take into consideration the practical problems of the movement of such loads, the economic factors involved, nor the convenience of the general public. In view of their successful co-operation over many years, it is also regretted that the Minister did not advise the heavy electrical and allied plant industry before issuing the draft regulations.

The reasons for the association's views were set out in an accompanying memorandum. This points out that the difficulties imposed on the industry by the lack of a modern road system have largely been overcome by co-operation with the Ministry in the routing of large loads and by technical development which has resulted in meeting the demand from at home and abroad for equipment of greater efficiency and capacity without a corresponding increase in size and weight. Nevertheless, the movement of heavy indivisible loads to the ports or sites "is difficult enough under present conditions without the Minister making matters worse by denying the use of the new motorways." Criticism from the public is bound to arise, the memorandum continues, if such loads are prevented from using modern motorways designed to by-pass congested towns and villages, where narrow streets and dense local traffic involve much manœuvring with consequent general delay and inconvenience.

While admitting that there may be good reasons in the national interest why the proposal should not include heavy indivisible loads constructed for defence purposes, the memorandum emphasises that the contribution of industry in times of peace to the national interest in the home and export markets is equally important. "The electrical and allied manufacturing industry is the second largest exporting industry in the country and any serious restriction on the movement of loads as envisaged in the proposed order would be a great handicap to the maintenance of its export trade." A modern road system would be one of the ways by which the industry could reduce its transport costs substantially and thereby improve its ability to compete overseas.

Since the Minister already has powers to control adequately the movement of very large or heavy loads, the B.E.A.M.A. consider there is no justification for arbitrarily excluding this class of industrial traffic from the new motorways. The Association's views on this problem were also expressed in a letter from Mr. Oldroyd published in *The Times* last Friday.

PROGRESS AT CERN

IN its annual report for 1957 the European Organisation for Nuclear Research (CERN) records that the coming into operation of the 600 MeV synchro-cyclotron last August has given rise to a new atmosphere in the organisation. Staff scientists and those from member countries can now actually perform experimental research on a CERN machine. The proton-synchrotron division has also entered a new phase as, after many years of preparation, the assembly of the accelerator components is now in progress. If no unforeseen difficulties arise the machine can be expected to come into operation in 1960 as planned. Preliminary work has been started on the preparation of a research programme for this 25 GeV proton synchrotron. A research group now being established will first be engaged on the design and construction of the heavy experimental equipment, which may take a few years to construct and should be available by the time the main machine is finished. By working in co-operation with the other divisions, and both theoretical and applied physicists, it is hoped to evolve the best method of using the proton synchrotron for fundamental research in physics.

Another group is studying the possible application of new techniques to the construction of high energy accelerators. These studies are especially important in case CERN should decide to extend its present programme.

Building activity on the site at Meyrin, near Geneva, reached its peak during the year and by the end of November practically the whole of the staff were accommodated there. On 1st January, 1958, M. F. de Rose (France) was appointed president of the council in succession to Sir Ben Lockspeiser, who had been president since the organisation's formation.

MAIN-LINE DIESEL-ELECTRIC LOCOMOTIVES

Completion of First to be Built by British Railways

AT Marylebone Station, London, last week we saw the first main-line diesel-electric locomotive to be erected in British Railways workshops under the British Transport Commission's railway modernisation scheme.

It is the first of a series of 1,160 h.p. diesel-electric locomotives, Nos. D. 5000-D. 5029, which are being designed and constructed to the requirements of the Commission under the direction of Messrs. R. C. Bond and S. B. Warder, chief mechanical engineer and chief electrical engineer respectively, of the British Railways central staff, the detailed design and supervision of construction being the responsibility of Mr. J. F. Harrison, chief mechanical and electrical engineer, Derby (London Midland Region). The whole design has been co-ordinated with the B.T.H. Co., who are the main contractors for the power equipment, and with Sulzer Brothers, the diesel engine manufacturers.

Thirty locomotives are now under construction at Derby, of which fifteen will go into service in the Southern Region, five in the London Midland Region, and ten in the Eastern Region. They will be used to replace steam locomotives and for the interim period during electrification of certain main lines.

The locomotives are being built to a 12ft 8in high loading gauge for working over the London Transport Executive lines. Some of the principal technical particulars are as follows:—

Maximum weight in working order: 75 tons.
Maximum axle load in working order: 18¼ tons.
Diesel engine h.p. at continuous rating: 1,160 at 750 r.p.m.
Maximum tractive effort: 40,000 lb.
Continuous tractive effort: 21,300 lb at 15 m.p.h.
Maximum speed permitted: 75 m.p.h.
Minimum curve: 4½ chains without gauge widening.
Wheel diameter: 3ft 9in.
Length over buffers: 50ft 6in.
Fuel capacity (engine and boiler): 630 gallons.

The locomotives are equipped to work in multiples with others of the same design and with all British Railways locomotives with B.T.H., Crompton Parkinson or English Electric electrical equipment.

To achieve a light construction, such components as drivers' cabs, roof hatches, radiator fan housings, cab and gangway doors, and air louvres are made of aluminium alloy. The underframe consists of two longitudinals, each comprising two standard channel sections placed back to back, the intervening space being enclosed at the top and bottom to form air ducts for ventilation and traction motor cooling.

The cable duct with oil and watertight covers has been provided along one side of the main longitudinals and on the other side pipelines run underneath the floor. The locomotives are fitted with "Oleo" pneumatic buffers and provision has been made for automatic central couplers.

Cab Heating and Ventilation

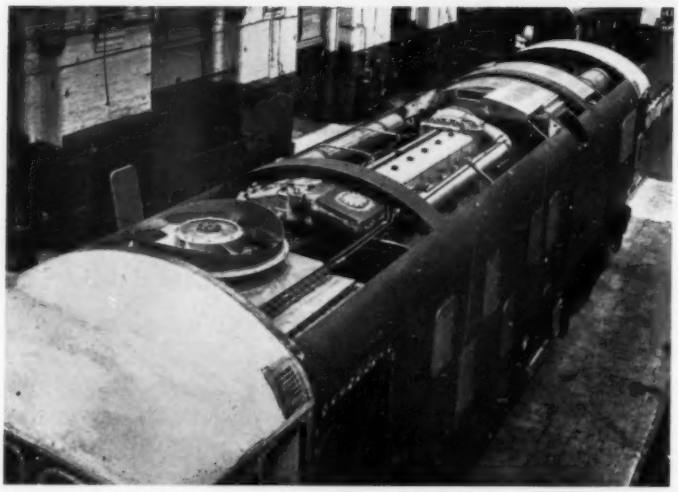
The superstructure embraces a driving cab at each end, the power unit and control compartment and the carriage warming boiler compartment with communicating doors between each. Side access covers and roof hatches are provided to facilitate installation and removal of major units, and also maintenance work. Air filters are fitted in the body side panels to ensure clean air in the engine generator compartment, and special care has been taken in sealing all possible sources of leakage of unfiltered air into the engine compartment.

The complete locomotive, including the cabs, is lined with Fibreglass navy board. The driving cabs are quite spacious. The two side doors are placed behind the driver's and assistant's seats. Cab heating and ventilation combined with a screen de-mister is fitted. Fresh air is blown in by an electrically driven blower through heating elements fed from the engine cooling system and controlled by the driver. The unit can be used for blowing cool air in exceptionally hot weather. Screen wipers are provided, and there is also a two-tone warning device.

A "wheel slip" light and "engine stopped" light are provided together with boiler and power equipment fault lights. These indicator lights glow dimly under normal

Above: Complete first main-line diesel-electric 1,160 h.p. locomotive erected in B.R. workshops

Right: Locomotive bogie showing final drive gear case, sand boxes, brake cylinder and bogie bolster



Main-line diesel-electric locomotive with Fibreglass roof removed to show engine, cooling system and fan

conditions, but become bright when a fault occurs. A detailed indicator in the engine compartment shows which actual part of the apparatus is giving trouble.

The bogies are of welded and riveted construction with box frames. Bogies of the first ten locomotives are to be fitted with Skefco axleboxes, while those on the second series of ten will have Isothermos axleboxes. The brake equipment is of the Oerlikon type, manufactured by Davies & Metcalfe, with Westinghouse brake cylinders. A straight air brake is provided for the locomotive and is operated through the driver's straight air brake valve in the driver's cab.

Brake Valves

An automatic vacuum brake is controlled by a driver's vacuum brake valve in each cab of the locomotive. The operation of this valve also controls, through a vacuum/air proportioning valve, the air brake on the locomotive, independently of the driver's straight air valve. The majority of the brake valves are contained in a brake cubicle to facilitate maintenance and ensure cleanliness. Each bogie carries four 8in Westinghouse horizontal brake cylinders, each incorporating a slack adjuster. Air for the locomotive brakes and for the air-operated control equipment is supplied by a Westinghouse DVC.2 compressor with a capacity of 39·5 cu ft/min against a pressure of 100 lb/sq in in the main reservoir. Vacuum for the train is provided by two Westinghouse exhausters which have a combined capacity of 220 cu ft/min at 1,000 r.p.m.

An anti-slip brake makes its first appearance in this country. This device consists of two relays, which are fitted singly between the two motors of each bogie, and any variation in speed of the motors creates a voltage differential which causes the indicator light in the cab to glow brightly. When this occurs, the driver eases off the power control lever and presses the anti-slip button which gives a slight brake application through the medium of an electrical impulse to the diaphragm of the air brake valve. Dimming of the indicator light occurs when the slip has been controlled and the power lever may then be opened up. Separate operating switches are provided for the anti-slip brake and for sanding.

The engine is a pressure charged six-cylinder four-stroke engine rated at 1,160 h.p. at 750 r.p.m. Five of the engines are being supplied from Sulzer Brothers' works in Switzerland, and the remaining twenty-five to Sulzer's orders from the Vickers-Armstrong works at Barrow. The generator unit comprises three machines: a main generator, an auxiliary generator and a differential exciter. The main generator is a single bearing, 12-pole, separately excited and self-ventilated machine. It is rated at 735 kW, 750/525 V, 750 r.p.m. The auxiliary generator is an eight-pole, separately excited, constant voltage machine of 32/50 kW, 110 V, 325/750 r.p.m., the armature being mounted on an extension of the shaft of the main generator. The exciter is a four-pole machine with separate, self and differential series excitation windings and is mounted on an adjustable platform on top of the auxiliary generator frame. It is belt driven from the main generator shaft extension. The four traction axle-hung motors are B.T.H., four-pole, force ventilated, 213 h.p., 525 V machines with a one-hour rating of 209 h.p., 490 V. Forced ventilation is by two blowers driven by one 12·2 h.p. motor, each blower serving a pair of motors.

Complete control of the main traction equipment is effected by a self-lapping air valve operated from the master controller. Maximum tractive effort is reached at a very low engine speed so that racing the engine to start the train is completely unnecessary. Field weakening is introduced in stages initiated by the generator load regulator. The traction motors are arranged in permanent parallel across the main generator and there are two stages of field weakening. The control gear is mounted in a cubicle near the main generator and includes pneumatic contactors for the four traction motors and electromagnetic contactors for engine starting and motor field weakening. The battery is contained in four pull-out boxes suspended from the underframe. Of the first twenty locomotives, ten will have lead-acid D.P. type RK.144 batteries of 48 cells with a capacity of 144 Ah at the five-hour rate, and the remaining ten will have alkaline Nife type DL.15 batteries of 72 cells with a capacity of 155 Ah at the two-hour rate. Battery charging sockets, external lighting connections, and hand inspection lamp sockets are provided on each side of the locomotive.

I.E.C. Publications

THE following four new publications of the International Electrotechnical Commission are obtainable from its central office at 1, rue de Varembé, Geneva, Switzerland, at the prices stated:—

No. 61, third supplement: recommendations regarding lamp caps and holders and gauges for control of interchangeability; revisions concerning small and medium-sized ceramic caps. 3 Sw. fr.

No. 65, first amendment: safety requirement for mains-operated radio-receiving apparatus, pending complete revision of the first edition (1952) and of its appendices 1 and 2 (1955). 2 Sw. fr.

No. 101, first edition: rules for testing auxiliary a.c. and d.c. motors and generators of vehicles. 6 Sw. fr.

No. 102, first edition: rules for testing main d.c. motors and generators for operating vehicles with diesel engines. 7·5 Sw. fr.

Dollar Exports Council's Report on Canada

OPPORTUNITIES FOR BRITISH MANUFACTURERS

A TOUGH and highly competitive market which offers great and growing opportunities to British manufacturers and corresponding rewards for the courageous and enterprising. This is the impression of Canada which the Dollar Exports Council delegation brought back from their 26 days' visit in April and May of this year.

In their report, published last week, the delegation have a special word of praise for the manufacturers of heavy electrical plant. These, they state, have "undoubtedly done a good job and they are fully alive to the future potential in Canada." Capital development programmes in Canada amount to several thousand million dollars each year and include many projects, such as oilfields, that offer scope for electrical equipment. The delegation found a willingness to invite British tenders, but because American and Canadian designers and specification writers are often not fully informed on British sources of supply, they recommend the British engineering trade associations to set up in North America a small staff to deal with this problem.

It was found that practically all the criticisms of long deliveries and broken delivery promises related to the past, and the same was true of criticisms of the style and presentation of consumer goods. Strikes, however, clouded the favourable atmosphere. The market for household goods is one in which Canadian industries are strong, but in view of the imports from other countries, the delegation feel British exporters have plenty of room for development. There is, however, evidence that the prices of many British goods are now very near the border line between success and failure, and the delegation found cases of shading of prices and cuts in margins by American manufacturers. Economic activity in Canada this year is expected to remain around the 1957 level.

The delegation emphasise that in their discussions no appeal was made to sentiment: "in many fields we can compete on quality, price, and now on delivery." Help is needed, however, to overcome the momentum of established trading habits. Throughout Canada the delegation found an acceptance of the good sense, in Canada's own interests, of larger imports from Britain and several provincial governments and municipalities have agreed to send their purchasing agents for tours of inspection in Britain. The Federal Government also recognises the importance of its taking a lead in encouraging imports of competitive goods from Britain.

Criticism of Distribution Arrangements

The report criticises the distribution arrangements for many British goods, stating that too many British firms rely on agents or brokers in one of the big cities for nation-wide coverage. Too many areas are too infrequently visited particularly by senior executives from Britain able to combine decisions on the spot with a real knowledge of the product. More British firms also need improved methods of supervising and supporting Canadian channels of distribution, including, at a later stage, the setting-up of their own organisations in Canada for assembly and manufacture.

The delegation consider most British firms have underestimated the advertising requirements of the Canadian market and they point out that it is a mistake for advertisements to be settled in Britain. Institutional advertising or a "Buy British Campaign" are not favoured, since British goods must be sold on the basis of value for money and availability. It is mainly industry's job to correct the shortcomings in its own public relations, and to take advantage of the impact on Canadian public opinion of the delegation's visit and that of the Canadian Trade Mission to this country. One way would be to offer papers and speakers to the many conventions held in Canada.

Presenting the report last week, the chairman of the Dollar Exports Council, Sir William Rootes, said that a conference would be held at Eastbourne in the autumn for detailed discussions of the trade prospects in Canada.

Training of Student Apprentices

A REPORT on the education and training of student apprentices has been published by the Council of the Institution of Electrical Engineers. It was prepared by the Joint Committee on Practical Training which is appointed by the Council in consultation with the public utilities and the trade associations representative of the electrical engineering industry in the power, electronic and telecommunication fields.

The student apprentice follows an integrated programme of practical training and academic education leading to a professional qualification. In practice, this includes both sandwich course students and students following a course of part-time study. The higher academic standards now required have made the route to professional qualifications by part-time study exceedingly arduous. Higher National Certificate courses now require between seven and nine years for completion and during this time the student has little opportunity for other activities normally associated with college life. The report stresses that wherever possible student apprentices should be allowed to attend sandwich courses.

The report is complementary to that on the training of graduates published in January, 1957. The advantage of the sandwich course is the correlation which can be established between study and practice and the report suggests that the sandwich course should be factory based. The factory-based course ensures that the same practical training is not covered more than once.

It is hoped that the report will be a useful guide to those in industry and in colleges who are responsible for the planning and conduct of student apprenticeships. It indicates the standards which have to be maintained, but it does not give any typical examples of apprenticeship schemes. Small firms and larger specialised firms are not well placed to provide the varied practical experience required by the apprenticeship schemes. In these cases it is hoped that a group of firms will combine in apprenticeship schemes and it is intended to hold a one-day conference at the Institution of Electrical Engineers in November to discuss such group schemes.

The report may be obtained from the I.E.E., Savoy Place, London, W.C.2, and costs 2s.

NEW ELECTRICAL EQUIPMENT

Inset Radiator

The latest "Chameleon" inset electric radiator just announced by BERRY'S ELECTRIC MAGICOAL, LTD., Touch-button House, Newman Street, London, W.1, can be fitted by itself or supplied in one of three surrounds. Fitted with the new 2½ kW "Paravec" heating element, a type in which heat and light are blended, it provides a slowly changing colour sequence to suit either summer or winter use. Both the models 490 and 491 "Chameleon" interiors can be fitted without a surround if sufficient cut-out space is available (31½in high by 30¾in wide by 9½in deep). The visible size is 26½in high by 31½in wide).

The price of the radiator alone is £27 15s 1d plus £6 9s 11d purchase tax in the United Kingdom.

The surrounds are not subject to purchase tax and the prices, finished in off-white, are:—No. 1, £23 19s (£21 15s filled and primed); No. 2, £16 12s (£14 5s); and No. 3, £19 5s (£16 17s).

Electric Cookers

The new "Moray" electric cooker, a recent product of the Electrical Appliance Division, ALLIED IRONFOUNDERS, LTD., 28, Brook Street, London, W.1, is constructed of cast iron and sheet steel and has a cooking capacity for up to six persons. The hob fittings include an 8in radiant type hotplate, as standard, a 6½in solid hotplate and a 10½ by 8in grill boiler. The oven (2,800 cu in) is 14in high by 14in wide by 14¾in deep and is heated by two open coil plug-in type elements, positioned at the sides. Above the oven is the grill chamber, 6in high by 12in wide by 16½in deep, and on each side of this are the controls. Three-heat switches are provided for the 6½in hotplate and grill boiler, a simmer switch for the 8in plate, and the oven is thermostatically controlled.

The overall height of the cooker is 42in (36in to top of hob) and it occupies a floor space 20in wide by 22in deep. External parts are vitreous enamelled (except for stove enamelled side panels) and the finish is cream, white, or pastel blue. The price of the "Moray" cooker is £34 19s. There is a two-plate model, price £32 17s 6d, and both can be provided with a drawer at £1 18s extra. Leg mounted models are also available.

Allied Ironfounders announce that special features are now available on both models of the "Falco Royal" electric cooker produced by their associate company, FALCO ELECTRICAL APPLIANCES, LTD., Corporation Road, Audenshaw, Manchester. A chromium-plated plate rack can now be fitted at an extra cost of £3 and the interior of the oven has been improved in that an automatic light, operated when the door is opened, can be supplied at an extra cost of £2.

Continental Type Candle Lamps

A range of lamps with very small bulbs for use in contemporary lighting fittings (particularly the multi-arm type) and other applications where small bulb size is desirable, has been introduced by ATLAS LIGHTING, LTD., 233, Shaftesbury Avenue, London, W.C.2. The new lamps, the Atlas "Continental" range, have an internal "Silverlight" finish which gives the soft, glare-free light in bulbs of this type which are usually used without a shade or diffuser.

There are two types. The first, the "Continental" lamp, has a 45 mm diameter spherical bulb and is available in 25 and 40 W ratings, priced at 2s 6d and 2s 9d each, plus 6d and 7d purchase tax, respectively. The second type, the "Continental Candle," is a 40 W candle lamp with a bulb only 35 mm in diameter, a size usually associated with 25 W rating. The price is 3s 6d plus 8½d purchase tax.

The lamps are available for 210/220, 230/240 and 250 V and both types with either s.b.c. or s.e.s. caps. In addition to these new lamps the company still offers the existing types of 25 and 40 W vacuum candle lamp with clear, pearl, "Softlight" and "Silverlight" finishes.

A similar range of lamps has been announced by EKCO-ENSIGN ELECTRIC, LTD., 45, Essex Street, London, W.C.2. The lamps will be known as Ekco round "Silverlight" lamps (45 mm) in 25 and 40 W sizes, and Ekco "Silverlight" candle lamps (35 mm) in the 40 W size. The prices will be the same as those for the "Atlas" range.

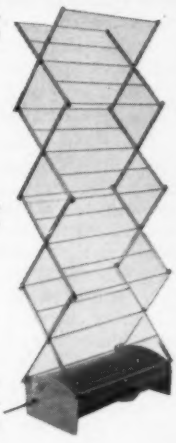
Cable Harness Strapping

A cable harness strapping, so designed that it locks on itself, has been produced by the TERMINATION EQUIPMENT CO., LTD., Noel Works, Elson Street, New Bosford, Nottingham. "Terma-Strap," which is claimed to be imperishable, is made from p.v.c. It is ¼in wide and is notched and slotted at ¼in intervals along its entire length. In use, it is pulled through itself to provide an adjustable self-locking loop, enabling any number of cables or wires to be strapped together. Slight warmth will facilitate ease of manipulation. Samples and prices may be obtained from the manufacturers upon request.

Heater and Clothes Dryer

The "Modeq" clothes dryer, manufactured by the MODERN EQUIPMENT CO., LTD., Bridgwater, Somerset, is now available with a redesigned heater unit which enables it to be used as an upright convector heater. Two models are being marketed, the "Minor" (1 kW) and "Major" (2 kW).

Each heater is 21in long by 13in high by 6in deep and the weight is



Left: Berry's "Chameleon" model 490 fitted in surround No. 1

Centre: Allied Ironfounders "Moray" three-plate electric cooker

Right: "Modeq Major" de-luxe clothes dryer (Modern Equipment Co.)

A.V.P. Industries "Tourist De-Luxe" battery operated dry shaver

Hadley "Multicom" desk unit

approximately 10 lb. The finish is in gold and red, with black handle, and the extending rack which is fitted when in use as a clothes dryer is of beech wood or anodised aluminium (de-luxe models). The racks when extended reach to a height of 60in. A tray, fitted with rubber feet, has also been designed to fit on to the heater so that it can be used as a plate warmer.

The price of the "Modeq Minor," with wooden rack, is £10 16s 6d plus £2 6s 11d purchase tax in the United Kingdom, and the "Modeq Major" de-luxe model with aluminium rack is £16 8s plus £3 11s purchase tax.

Water Heater

A new water heater, the "Double-Two," with a 2 gal capacity and a 2 kW loading, has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. Because of its fast heating, thermostatically controlled element the hot water output is claimed to be equivalent to that of a heater with greater storage capacity, the water being heated from cold within 18 min. An alternative loading of 1·2 kW is available which heats from cold in 30 min. The heater can be connected to the water mains or to the cold water tank and, because of its tinned copper interior, it can, if connected to the water mains, be used for filling kettles and for other cooking purposes.

The heater is supplied as standard with a 9in spout and is designed for wall fixing. When fixed, there are no screws or brackets in sight. The steel outer casing is stove enamelled in white or honeysuckle, supplemented by a four colour choice of bands. The price of the heater is £11 10s plus £2 13s 10d purchase tax in the United Kingdom.

By making use of the G.E.C. "Easy-Plumb" kit (price 18s), plumbing for this heater is extremely simple as only one pipe is needed—to the nearest cold water pipe. The kit is complete

G.E.C. "Double-Two" 2 gal water heater

with all the parts necessary to connect the heater to the back of a standard size cold water tap, including a 3ft length of polythene water pipe which can be shaped and bent simply by immersing in water. The only tools needed are a penknife and a spanner.

Battery Dry Shaver

A battery operated dry shaver, the "Tourist De-Luxe," which operates from four U.12 batteries contained within the shaver itself, is being marketed by A.V.P. INDUSTRIES (SALES), LTD., 35, Berkeley Square, London, W.1. The casing is of cream coloured plastic, with black foil cap and cover, and the weight is only 9½ oz. It is small enough to slip into the pocket, measuring only 3¼in in length by 2¼in wide by 1¼in deep. With one set of batteries it is claimed to be capable of six weeks' average daily shaving.

Each shaver is supplied, complete with cleaning brush, in a zipped case of plastic pigskin. The price (less batteries) is £5 3s 7d plus £1 2s 5d purchase tax in the United Kingdom.

Food Mixer Attachment

An automatic bean slicer and pea huller is the latest attachment to be introduced by the KENWOOD MANUFACTURING CO., LTD., Old Woking, Surrey, for their Kenwood "Chef" food mixing machine. A dual purpose attachment, it is ready for immediate use as a bean slicer and can be quickly converted for use as a pea huller. Sufficient beans to serve sixteen people can, it is claimed, be handled within four minutes.

The price of the attachment is £2 4s 7d plus 4s 11d purchase tax in the United Kingdom.

Intercommunication Unit

External and internal improvements to the "Multicom," which provides two-way loudspeaking or telephone communication between all points on the system, are announced by HADLEY TELEPHONE & SOUND SYSTEMS, LTD., Smethwick, Staffs. The cabinet has been redesigned on contemporary lines, with overall dimensions of 14in by 6½in by 6in. Technical improvements to the unit include the use of printed circuit and hermetically sealed relays with platinum pointed contacts. The telephone cradle at the side of the cabinet has been re-styled, the handset now resting on a neat pair of bead-ended light chromium-plated rods. There are two models of the "Multicom," one serving up to seven points and the other up to twenty.

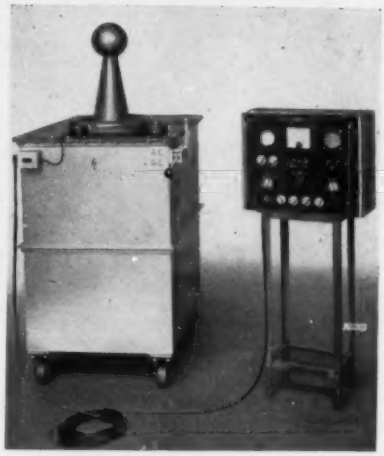
Flash Tester

A 100 kV flash tester recently produced by AIRMEC, LTD., High Wycombe, Bucks., provides a means of high voltage testing of materials and components up to 140 kV peak a.c. or d.c. The e.h.v. unit is housed in a steel, oil-filled case mounted on wheels. A control unit, installed at any distance up to 36ft away and electrically isolated from the e.h.v. source, provides a remote control facility which can be operated with absolute safety.

Adequate metering of output voltages and leakage currents is provided and a cathode-ray tube permits waveform analysis of input voltages and leakage currents to be made during test. Breakdown or flashover is indicated by a glowing neon tube and a thermal overload switch in the control unit is operated if the test piece maintains full load for any appreciable time but will re-set after a short period when normal operations can be resumed.

Since both c.r.t. and loudspeaker indication of ionisation are provided, the voltage at which ionisation starts is at once evident and tests may be discontinued before breakdown of the test piece occurs. The maximum safe working voltage of any component is therefore readily ascertained and it is possible to grade any test piece without the necessity of testing it to destruction. The equipment operates from a 200-250 V 50 c/s a.c. power supply and has a total consumption of 1 kVA on full load. The price of the equipment is £395.

Airmec 100 kV flash tester



GENERATION AND DEVELOPMENT

A recent photograph showing the progress made in the erection of the No. 1 reactor building at the Hinkley Point nuclear power station

Progress at Hinkley Point

Work is proceeding rapidly on the construction of the nuclear power station at Hinkley Point, Somerset, by the English Electric Babcock & Wilcox Taylor Woodrow group. A great deal of excavation has been going on and is continuing. Work on the heavily reinforced concrete biological shield for the No. 1 reactor began in January and by last month 13,000 cu yd of concrete had been placed in the shield and foundations; the foundations for the No. 2 reactor shield are nearing completion. A reinforced subway for the h.v. cables from the turbine house to the 275 kV switchgear compound is also on the way to completion.

All this has followed the provision of substantial ancillary work necessary for the purposes of construction.

Poisonous Pole Preservative

Trouble seems to have been experienced in the Midlands area from an impregnant employed by the Electricity Board to preserve its wood poles. At a meeting of the Electricity Consultative Council a member stated that since the previous meeting 22 cows had died through having access to the poisonous substance injected into poles. To guard against this the Board proposed to guard the poles with aluminium sheeting. The chairman said that the problem was being considered at national level.

New 33 kV Substation at Bath

On 24th July the Mayor of Bath (Councillor H. Roberts) switched on a new £67,000 high voltage substation at Twerton, Bath. Mr. A. N. Irens, chairman of the South Western Electricity Board, explained that with the increase in load it had been found necessary for a new 132 kV bulk supply point to be established near Radstock which, in addition to supplying the rural area around Bath, could also feed into the west end of the city. A 33 kV cable had been planned to link up this new grid substation with the power station. Although this provided adequate supplies from alternative sources, under present conditions the problem had to be faced of supplying the city when the power station came to the end of its useful life in two or three years' time. The Board therefore decided to establish additional 33 kV substations which would serve the city and its outskirts. Two of these had now been built at Batheaston and Twerton, and others no doubt would be required as the load developed.

Irish Board's Five-Year Plan

The Electricity Supply Board, Dublin, is preparing a new five-year development plan and is discussing with Bord na Mona (the State peat development organisation) the extent to which generating capacity can be based on the use of peat.

By the end of this year the greater part of E.S.B.'s present programme will have been completed. Within the next week or so a 15 MW coal-fired station in the coalfield area of Leitrim and a 20 MW peat-fired station at Lanesboro are due to come into operation. The station at Lanesboro will use about 90,000 tons of sod-peat annually. A 4 MW hydro-electric station at Clady River, in Donegal, is expected to be completed next December. The installed capacity of the E.S.B. system will then total 688·5 MW as compared with 382·5 MW in 1954 when the present development programme was approved.

In the period up to 1963 two further stations—at Rhode, Co. Offaly, and at Bella-corick, Co. Mayo—will come into operation. These stations will use milled peat and will have an installed capacity of 40 MW. The station at Rhode will be completed in 1960; its 260ft high cooling tower has already been erected.

Transport in Wolverhampton

The Wolverhampton Corporation Transport Department operates a fleet of 153 trolley-buses and 140 motor-buses. In his report for 1957-58, the general manager (Mr. R. H. Addlesee, M.Inst.T., M.I.T.A.) shows that the former ran an average of 121 miles per day for each vehicle in service and the latter 112 miles. Total vehicle mileage for the trolley-buses was 5·7 million and for the motor-buses 4·8 million. Consumption of electricity for traction purposes amounted to 15·4 million kWh, equal to 2·704 kWh per mile. The year's working resulted in a net surplus of £36,709, against £3,717 for the previous year.

Bradford City Transport Diamond Jubilee

Speaking at a luncheon in Bradford Town Hall on 23rd July to mark the diamond jubilee of the Bradford Corporation Transport Department, which began operating electric trams on 30th July, 1898, Councillor Tom Wood, chairman of the Corporation Transport Committee, expressed his confidence in the future of the city's municipal transport undertaking. Given a span of three or four years, he believed the Department would find itself clear of debt. He praised Bradford's reliance on the dual system of trolley and motor buses. In the last seven years, due to cheaper operation costs, trolley-buses had consistently made a profit whereas motor buses had shown a loss. During the morning Mr. Humpidge had conducted members of the committee and department officials on a jubilee inspection of the Thornbury depot and works, where they had a ride in the works yard on Bradford tramcar 104, which has been preserved by a group of local enthusiasts. They were told that Bradford's next batch of re-bodied trolley-buses would seat seventy passengers and would have front entrances with power-operated doors.

New London Transport Rolling Stock

London Transport has now prepared provisional designs for the new cars to be ordered at a cost of more than £5 million for the Metropolitan Line services to Amersham, Chesham and Watford. The stock is expected to enter service in 1961.

Each train will consist of four driving motor and four trailer cars, and will have a length of 431ft 6in over couplers. The eight cars will be arranged in two units each consisting of a driving motor car, two intermediate trailers and another driving motor car. Auto-couplers will be fitted at the outer ends of each four-car unit. Each driving motor car will have 54 seats and the trailer cars 58. The main lighting will be by two parallel rows of 4ft fluorescent tubes

arranged down the centre of the roof of each car. Two prototype motor bogies for the new stock are now under construction at the Acton Works. The design of the new cars is not yet final, except as regards seating arrangements, and may be amended before orders are placed.

Council House Installations

Morpeth Rural District Council is considering the installation of socket-outlets in 350 old Council houses. The cost is estimated at £3,150.

OVERSEAS

Rapid Development in George Town

During 1957 three 10 MW steam turbo-alternator sets with their boilers and ancillary plant were put into commercial operation at the George Town City Council's new power station on Penang Island, thereby completing the present stage of development of the station, which has been designed for an ultimate installed capacity of 50 MW. Referring to this in his annual report, Mr. M. B. Parsons, A.M.I.E.E., the city electrical engineer, adds that the site is large enough for the future construction of a "B" station as well, when the increasing system demand requires it.

A 21·4 per cent increase in electricity sales in 1957 compared with 1956 enabled the undertaking to earn a net surplus of £31,600, after meeting all working expenses including £164,000 in respect of interest and sinking fund payments on loans. This high rate of expansion is continuing and sales during the six months ending 30th June last were 22·5 per cent greater than the corresponding period in 1957.

An innovation last year was the extension of the undertaking's popular simple hire scheme to include 1 h.p. air-conditioners, each of which normally consumes some 4,000 kWh per annum, assuming that it operates for 10 hours a day. Although only 46 air-conditioners were on hire at the end of 1957, their popularity is steadily increasing and Mr. Parsons expects that by the end of this year the number on hire will exceed 175. The promotional value of this simple hire scheme is very great, as large numbers of consumers are purchasing their own air-conditioners now that the value of this type of equipment for shops, offices and bedrooms is becoming generally known in Penang.

The "distributed transformer" principle has been followed in the design of the distribution network, so that apart from some reinforcement of the 11 kV mains a considerable increase in distribution capacity is obtained merely by the provision of additional 11/0·4 kV transformer substations. Underground cable laid during 1957 included 4 miles of 11 kV and 10½ miles of medium-voltage distributors, 8¼ miles of the latter being laid in the old part of the city where hitherto d.c. supply only was available.

Development in Ceylon

A three-year plan to provide electricity to a number of villages in Ceylon in the Western, Sabaragamuwa, Southern and North Western Provinces has been prepared by the Department of Electrical Undertakings. Nearly 50 villages will benefit by this scheme. Special attention is being paid to those in which electricity supplies will assist in the development of local industries such as weaving and pottery. The need to supply cheap power to the villages for their industrial development has been emphasised by the Minister for Transport, who has asked Ministry officials to submit plans to harness the waterfalls in the up-country areas to generate electricity which could be supplied at cheap rates.

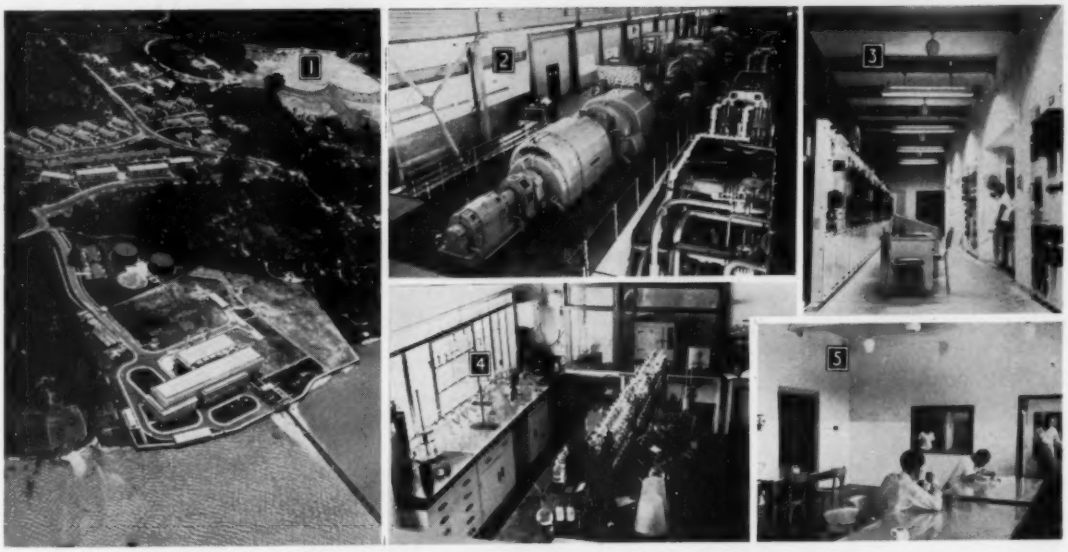
Stage IIA of the Laxapana hydro-electric scheme has been completed, raising the total hydro-electric plant capacity from 25 to 50 MW. Plans are now in hand for completing the next stage of the scheme, designed to generate 50 MW.

With a view to making the Gal Oya, in South Ceylon, and Laxapana, Central Ceylon, reservoirs complementary to each other in times of drought, the supply systems are to be linked in an all-island grid. Transmission lines linking up the two power projects will be constructed at an estimated cost of Rs.11,500,000. Canadian aid under the Colombo Plan is expected to finance this project.

Queensland Water Power Project

The Brisbane correspondent of the *Financial Times* reports that the Queensland State Government has approved the construction of a hydro-electric station on the Barron River, near Cairns, North Queensland, at a cost of £A10 million. First power is expected from the station in 1963. Mr. Evans, Minister of Mines, said that the need for the new station arose from the rapid growth of demand for power in North Queensland. It will supplement another power project, costing £A12 million, on the Tully River, 100 miles south-west of Cairns.

1. General view of the new Penang power station and staff housing estate. 2. The three 10 MW English Electric turbo-alternators. 3. Control room. 4. Chemist's laboratory. 5. Staff canteen



Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets have continued naturally to set their course in accordance with the interpretation of the news from the international front. By the end of the second week of the Middle East crisis, stock prices had recovered their equilibrium so well as to show scarcely a trace of the initial set-back. In both the gilt-edged and the industrial sections quotations were moving up again to their best levels of the year. Performance remained very sensitive to changes in political sentiment, and with activity at a low ebb it has been taking only a small amount of business to shift prices one way or the other but the underlying strength of the markets has been impressively demonstrated.

G.E.C. Report

The £1 shares of the General Electric Company took a distinct turn for the better after the appearance of the full annual report, the price being marked up from 32s 6d to 34s 9d in the market. (The official quotation was 33s 9d.) Mr. Leslie Gamage's review confirmed that the recession in profits during 1957–58, despite a 6 per cent expansion in sales, had been the consequence of continued pressure on margins. Although of the opinion that any substantial improvement in profits could come only from an improvement in general conditions and a lightening of restrictions, the chairman indicated steps that were being taken within the group which should lead to better results even without such assistance. He disclosed that orders outstanding (including the atomic power station contract) at the beginning of this year exceeded £110 million. In general, the review fortified market confidence in the maintenance of the dividend at its present rate of 10 per cent.

Price Changes

English Electric shares advanced well to 55s, in sympathy with the improvement in G.E.C., but otherwise the price lists show little further alteration among the leading electrical equipment issues. In the cables group, B.I.C.C. were better at 42s 3d, and Scottish Cables continued their rise, to 16s 3d, in anticipation of the scrip issue. Gains in Metal Industries and Ward & Goldstone reflected further consideration of the recently issued annual results. S. Smith were again well supported, up to 10s; the company's financial year has just ended. Others to gain ground included Hoover, Plessey, Walsall Conduits and Automatic Telephone. Efco 10s shares were marked up to 22s 9d on the company's announcement of increases in profits and in the dividend, from 12½ to 15 per cent.

E. K. Cole Meeting

In the year ended last March, earnings of the E. K. Cole group contracted a little to just under the million mark (before tax and depreciation), and the company paid a 17½ per cent dividend for the fourth year in succession. At 15s 3d, the 5s shares stand

Price Changes in

Company or Board	Nom. Value	Middle price 28th July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76	+1	3	3	3 19 0	76	72
Brit. Elec. 1974/77	100	73	+½	3	3	4 2 3	73½	68½
Brit. Elec. 1976/79	100	77	+½	3½	3½	4 11 0	77½	72
Brit. Elec. 1974/79	100	87	+½	4½	4½	4 17 9	87	82½
Overseas Electric Supply								
Calcutta Elec.	£1	16/-		6†	6·8†	8 10 0†	16/9	15/-
East African Power	£1	18/6		7	7½	8 2 3	19/-	17/6
Nigerian Elec.	£1	13/9		10	10	14 11 0	17/-	13/9
Perak Hydro-Elec.	£1	13/6		10	12½	18 10 6	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	12/-		17½	17½	7 5 9	12/-	9/9
Aerialite	1/-	6/9		48	51½	7 12 6	7/-	5/1
Allen, W. H.	£1	37/3		10	11	5 18 0	37/3	32/9
Anglo-Portuguese Tel.	£1	24/9		8	9	7 5 6	27/3	19/9
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	57/6	53/-
Assoc. Elec. Ord.	£1	50/-		15	15	6 0 0	51/3	46/6
Automatic Tel. & El.	£1	66/3	+1/3	17	17	5 2 6	66/3	57/-
Babcock & Wilcox	£1	47/-	−9d	15	13‡	5 10 9	52/9	41/9
Bakelite	10/-	18/9		15	15	8 0 0	21/-	17/6
Baldwin, H. J.	2/-	2/6		20	20	16 0 0	3/9	2/6
Berry's Electric	5/-	6/-		10	10	8 6 9	7/6	5/9
British Aluminium	£1	47/6	+1/3	12	12	5 1 0	47/6	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	26/-	+1/6	25	25	4 16 3	26/-	19/6
B.I. Callender's	£1	42/3	+9d	12½	12½	5 18 3	45/6	38/9
B.I. Callender's 6% Pref. ...	£1	19/-		6	6	6 6 3	20/3	19/-
British Tabulating	£1	50/6	+1/6	9	10	3 19 3	51/3	38/6
British Thermostat	5/-	29/6	+3d	25	30	5 1 9	30/-	19/9
British Vac. Cleaner	5/-	5/3		10	10	9 10 6	5/3	4/6
Brook Motors	10/-	37/6		25	25	6 13 3	37/6	33/3
Bulgin, A. F.	1/-	5/3		40	45	8 11 6	5/6	4/7
Bulpitts	5/-	7/6	+3d	—	12½‡	8 6 9	7/6	7/3
Burco Dean	5/-	8/3		20	22½	9 1 9*	9/6	7/9
Cable & Wireless: Ord.	5/-	10/6		10	10‡*	4 15 3	10/6	8/-
4% Loan	100	93½		4	4	4 5 6	94½	89
Chloride El. Storage "A" ...	£1	57/-		17½	17½	6 2 9	62/-	55/6
Clarke Chapman	£1	125/-		27½	27½	4 8 0	7½	5½
Cole, E. K....	5/-	15/3		17½	17½	5 14 9	18/-	15/3
Cossor, A. C.	5/-	4/6		Nil	2½	2 15 6	5/6	4/4
Crabtree	10/-	28/6	+6d	20	20	7 0 3	28/6	24/4
Crompton Parkinson Ord. ...	5/-	10/3		16	16	5 4 0*	10/6	8/3
De La Rue	10/-	22/9	−6d	35	17½*	7 9 0	26/3	20/9
Decca "A"	4/-	25/9	+3d	43‡	43‡	6 16 0	27/6	21/3
Desoutter	5/-	16/6		32½	18½*	5 13 9	16/6	13/6
Dewhurst	2/-	7/6		16½	20	5 6 9	8/-	6/9
Dictograph Tel.	2/-	6/3		20	20*	6 8 0	6/3	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	8/-		25	25	7 16 3*	9/4	7/9
E.M.I.	10/-	37/3	+2/-	15	15	4 0 6	37/3	27/6
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	7/-
Elec. Construction	£1	23/9		8½	8½	7 3 3	25/-	21/-
Elliott-Automation	5/-	14/6		—	10‡	3 9 0	14/6	11/6
Enfield Cable Ord.	£1	13/6		Nil	2½	3 14 0	17/-	10/9
English Electric	£1	55/-	+1/9	14	14	5 1 9	56/3	44/-
English Electric 3½% Pref. ...	£1	12/-		3½	3½	6 5 0	12/3	11/9
Ericsson Tel.	5/-	20/6	+9d	22†	12*†	2 18 6†	21/-	17/6
Ever Ready	5/-	18/6	+6d	37½	20*	5 8 0	19/3	13/9
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	38/9	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

about half-a-crown below their recent best, and offer a yield of 5¾ per cent. At last week's annual meeting the chairman reported a substantial rise in turnover during the year, thanks largely to the acquisition of Ferranti radio and television, and attributed the decline in profits partly to non-recurring expenses in establishing the commercial side of that business. Other factors included a decline in Government orders for certain defence equipment. Domestic television and radio sales continued to make the main contribution to earnings, and the chairman had a good deal to say about the effect of purchase tax uncertainties upon the level of demand.

Electrical Investments

Company or Board	Nom. Value	Middle price 28th July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	33/9	+1/3	12½	10	5 18 6	38/9	29/3
G.E.C. 6½% Pref.	£1	20/3		6½	6½	6 8 6	21/3	20/3
General Cables	5/-	10/-	−3d	30	24	—	11/9	10/3
Greenwood & Batley	£1	48/3		17½	20	8 5 9	48/3	45/-
Hackbridge Holdings	5/-	13/3		30	20	7 11 0	14/3	7/6
Hackbridge & Hewittic	5/-	11/-		20	20	9 1 9	12/-	9/7
Head Wrightson	5/-	20/3		22½	17½*	4 6 6	22/3	16/9
Heatrae	2/-	6/-		15	20	6 13 3	6/-	4/-
Henley's	10/-	11/3	+3d	11½	11½	10 4 6	14/6	10/6
Holophane	5/-	13/3		30	37½	8 10 0*	13/9	12/6
Hoover	5/-	44/-	+1/6	50	50	5 13 9	44/-	31/-
I.C.I.	£1	29/3	+3d	10	12	5 9 6*	30/3	23/9
Intl. Combustion	5/-	26/6		22½	25	4 14 3	26/6	19/3
Johnson & Phillips	£1	16/3		10	5	6 3 0	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	14/9		15	15	5 1 9	14/9	12/6
Lister, R. A.	£1	24/6		10	10	8 3 3	26/3	23/-
London Elec. Wire	£1	45/-	+6d	12½	12½	5 11 0	45/-	39/6
Lucas, J.	£1	36/9		7½	7½	4 1 9	37/6	27/9
Marconi Marine	£1	32/-		10	10	6 5 0	32/6	29/-
Marryat & Scott	2/-	13/3		35	37½	5 13 3	14/-	10/3
Mather & Platt	£1	38/9		15	15	5 3 3*	40/-	29/6
Metal Industries	£1	35/-	+1/6	9	14	8 0 0	35/-	22/9
Midland Elec. Mfg.	£1	46/3		12½	12½	5 8 0	48/3	44/-
Morphy-Richards	4/-	16/-		50	20*	5 0 0	16/9	14/6
Murex	£1	50/6		20	17½	6 18 6	58/3	49/3
Newman Ind.	2/-	2/3		10	10	8 17 9	2/9	2/3
Oldham & Son	1/-	2/6		17½	17½	7 0 0	2/7	2/3
Parnall (Yate)	5/-	15/-		12	12	4 0 0	15/-	5/9
Parsons, C. A.	£1	46/3		8½	7½*	3 4 9	53/6	43/-
Plessey	10/-	58/-	+6d	30	30	5 3 6	60/6	55/-
Pye "A" Deferred	5/-	12/6	+1/3	12½	12½	5 0 0	13/9	10/-
Reyrolle	£1	76/3		17½	17½	4 11 9	84/6	73/6
Rheostatic	4/-	6/-		12½	12½	8 6 9	8/-	6/-
Richardsons Westgarth	10/-	13/6		16½	8½*	6 3 6	15/-	13/-
Scottish Cables	4/-	16/3	+3d	27½	27½	6 15 3	16/3	12/3
Simon-Carves	5/-	26/9	+6d	20	25	4 13 6	27/9	22/6
Smith (England), S.	4/-	10/-	+9d	17½	20	4 0 0*	10/-	7/-
Southern Areas	£1	9/9	−6d	7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	4/9		15	15	15 15 9	6/3	4/9
Sturtevant	5/-	14/9		15†	15†	5 1 9†	18/-	14/9
Sun Elec.	£1	50/-		25	25	10 0 0	50/-	47/3
Switchgear & Cowans	5/-	11/9		25	22½	9 11 6	11/9	8/9
Taylor Tunnicliff	5/-	13/3		15	17½	6 12 0	13/9	11/9
T.C.C.	10/-	33/9	−1/3	25	25	7 8 3	38/6	33/9
T.C. & M.	£1	23/6	+6d	8½	8½‡	7 4 9	27/-	20/-
Telephone Mfg.	5/-	4/9		10	10	10 10 6	5/3	4/6
Telephone Rentals	5/-	12/-	+6d	12½	12½	5 4 3	12/-	9/9
Thompson (John)	5/-	24/-		25	25	5 4 3	27/-	23/-
Thorn Elec. "A"	5/-	21/3		15	17½	4 2 3	23/3	17/-
Thornycroft	£1	21/3		12½	12½	11 15 3	27/9	21/-
Tube Investments	£1	55/-		13½	15	5 9 0	55/6	48/3
Vactric	5/-	15/6	+6d	25	25	8 1 3	15/6	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	15/3	+1/-	20	22½	5 18 0	15/3	11/-
Ward & Goldstone	5/-	27/-	+6d	40	25*	4 12 6	29/-	23/6
Watford	2/-	6/6		25	25	6 3 0*	7/6	5/-
Westinghouse	£1	38/6		18	10*	5 4 0	40/-	32/3
West, Allen	5/-	11/9	+3d	15	12½*	5 6 6	12/-	9/3
Wolf Electric	5/-	7/3		20	10*	6 18 0	9/-	6/9

Pressed Steel Debenture

Although issued in unfavourable market conditions, the Pressed Steel Company's offer of £3½ million 6 per cent debenture stock 1978–83, at a price of 98½, was substantially over-subscribed by holders of the company's other stocks, and established a premium of about a point in early dealings. Proceeds of the issue are to be used largely in enlarging and improving the facilities for the output of motor-car bodies and refrigerators. Annual interest on the new stock, and on an equally ranking debenture, is estimated to be covered twelve times over by last year's profits and the principal amount of the two stocks combined nearly four times by net assets of the group. The debenture is now 25 per cent paid-up, and is for the present transferable free of stamp duty.

Commercial Television

A matter for special remark is the burst of interest displayed during the past week or two in the shares of companies interested in the financial side of commercial television. This seems to have been touched off by the publication of the annual report of Associated Television, the contractors for the week-end programmes from London and the week-day transmissions from Birmingham. This company's operating profit is shown to have jumped from under half a million to over £4 million, and a dividend of 30 per cent for the year 1957–58 is being paid. The company's shares have no official quotation, but dealings have been taking place, under a special rule, at over £7 per share. This puts them on a yield basis of about 4 per cent, which reflects in part the highly conservative character of the dividend, and also no doubt a view that the possibilities are still by no means exhausted.

Associated Rediffusion

There is no market as yet in the shares of Associated Rediffusion, the contractors responsible for London's mid-week commercial television programmes, but there has been much activity, and a sharp rise in prices, among the issues of the companies financially interested in that enterprise. Of these, the 5s shares of Rediffusion (formerly Broadcast Relay Services) have been marked up this month from 24s to 28s, and the 5s "A" deferred shares of British Electric Traction from 23s to 26s. Both these companies have issued their annual reports fairly recently. Rediffusion paid, effectively, a 12½ per cent tax-free dividend, and the B.E.T. distribution totalled 25 per cent. The yields on the shares are respectively a little over 3¾ and 4¾ per cent.

REPORTS and DIVIDENDS

The General Electric Co., Ltd.—The preliminary figures for the year ended 31st March were published in our last issue, and they are confirmed by the full report and accounts now issued. These include for the first time an illustrated summary of the year's work, as well as a review of the year by Mr. Leslie Gamage (chairman).

Mr. Gamage, after referring to board changes, comments on the trading conditions for the year under review. He says that in the home market the increase in the bank rate, the curb on credit and investment, the engineering strike and wage advances have adversely affected the financial results of all departments. Overseas, their trading has been affected by much the same conditions as those at home. The governments in their main markets have been taking much the same steps to curb inflation, and as a result they have had to face new import restrictions in most markets and a general slowing down of activity. In spite of these adverse conditions they have secured a modest increase in turnover which has for the first time in the company's history passed the £100 million mark. The increase, however, was not sufficient to counterbalance the fall in the margin of net profit. Expenditure on research and development constitutes a heavy charge under to-day's conditions, but is vital for the company's future. The volume of orders received shows a considerable advance, but if they exclude the atomic energy contract, orders received and orders in hand are both slightly less than in the previous year. In consequence their delivery dates have materially improved.

Turning to the activities of the three main groups comprising the company, Mr. Gamage says that the General Products Group produced a turnover at home and overseas of £63¼ million, or 61 per cent of the total. Their considerable investment in the light engineering side differentiates the G.E.C. from some of its major competitors with which sometimes their results are incorrectly compared. Trading in this group is very sensitive to prevailing economic conditions and it has been more affected than either of the other two groups by the Government's restrictive measures on purchase tax, credit and hire-purchase. From an export point of view it is important to have a basis of a substantial and expanding home market, and it is hoped therefore that further relief in purchase tax and hire-purchase restrictions will not be long delayed. Particularly is this to be desired if this country is to participate in the European Free Trade Area and meet the intensified competition from the Continent.

Their sales of "Osram" lamps both at home and overseas have increased, but the market remains highly competitive and margins are not adequate. On the lighting side their turnover has again increased; the re-planning and re-equipment of the fittings factory at Birmingham has made good progress and will bring into operation additional production capacity during the current year. In street lighting also their turnover has increased, and in aviation they are the only British manufacturer able to undertake the complete electrification of any size of aerodrome. On the installation side—wiring accessories, ironclad switchgear, cable, conduit and conduit accessories—business has felt the effect of the slowing down in building programmes due to credit restrictions. In the cable business, apart from the effects of credit restrictions, the downward trend of copper prices has caused buyers to exercise caution, but in rubber and plastic cables and wires the year has not been unsatisfactory. They have benefited during the year by the expansion of the radio and television market.

In the Engineering Group it has been clear for some time that the range of equipment which they manufacture is not only widening but individual units of plant are becoming ever larger. The company have extended manufacturing facilities to meet these changing conditions and also to enable them to take an increasing share of business resulting from the projected expansion all over the world of power generation, mining and industry generally. They are becoming increasingly involved in undertaking the design and supply of composite projects on a "turn-key" basis. They manufacture within their own organisation the bulk of the equipment required for such projects, and within this group a power section has been formed which enables them to undertake the design, layout and construction of projects of considerable magnitude. The long-term prospect in the manufacture of capital equipment is encouraging, particularly when money becomes more freely available in the overseas as well as in the home market. Mr. Gamage refers to the close collaboration with Simon-Carves, the Motherwell Bridge & Engineering Co., and John Mowlem & Co. in the atomic energy field, which has enabled not only design, but site construction, at Hunterston, to proceed at a rapid pace.

The Telecommunications Group celebrated its golden jubilee this year. Its profits have declined during the year under review, mainly as a result of reductions in the flow of orders. Outlook as far as the home market is concerned depends largely upon Government policy which has resulted in reductions in orders from the Post Office. This group has, therefore, had to turn its attention even more to the export field, but export markets are highly competitive.

Mr. Gamage reviews the activities of the subsidiary and associated companies and then turns to exports. He says that though last year's total of £23 million shows a drop compared with the previous year, in that year they were shipping an unusual offshore contract to the United States amounting to over £2 million. The works in India, Australia and in New Zealand have done well and modest profits were achieved in South Africa, Malaya and Hong Kong. The company's business in the British Commonwealth is conducted through an overseas branch network, constituted as separate companies.

The outstanding feature of their research and forward development activities during the past year has been marked concentration of effort in three fields—crystal valves, new aspects of telecommunications, and nuclear power generation. In the field of Defence they have made major contributions to research and development projects at the Applied Electronics Laboratories at Stanmore and at the Coventry establishment.

Commenting on the outlook, Mr. Gamage stresses that the company's present policy is to expedite plant modernisation programmes and to overhaul, cheapen, and make more effective its distribution methods; any substantial improvement in their profits can only come from the betterment of conditions and the lightening of restrictions which at present clog their progress. He sees no reason why a recession arising from special circumstances in the United States should spread to these shores. A slowing up of orders may be felt in the export trade for a time, but the flow of business will resume on a sounder basis than before, when the necessary adjustments have been made.

The annual meeting of the company will be held on 4th September.

Vactric, Ltd.—As we reported in our issue of 27th June, the report and accounts for the year to 29th March now issued show a net profit of £159,785, as compared with £249,632 for the previous year. The dividend for the year is maintained at 25 per cent by a final payment of 15 per cent and £79,491 is carried forward (against £47,491 brought in).

In his review of the year, Mr. W. C. Pegley (chairman and managing director) says that the reasons for the lower profits are increased manufacturing costs and heavier selling expenses, resulting in narrower margins, which have become a permanent feature of the appliance trade, and which they can only combat by a rigid control on expenditure and a drive for a higher turnover; this continues to show a steady increase. The Vactric electric washing machine did not achieve the targets in turnover and profits which they set for it, on account of failure by a sub-contractor to maintain supplies of an important component. In recent weeks they have, however, been able to approach the desired production levels, enabling

them to obtain an increasing share of this expanding market. They are still unable to report profitable trading from the Canadian subsidiary. The Precision Tool Co. is currently suffering from the diminution in work available from the aircraft industry which is its chief customer. The Control Equipment Co. has made considerable strides in the development of new and specialised equipment, for which the intake of orders has been encouraging. In the year under review, however, neither of these companies registered results as good as its previous year's record. Current trends of trading are encouraging. The recent reduction in purchase tax has been of assistance.

Permali, Ltd.—In his statement, which has been circulated with the report and accounts for the year to 29th March last, Mr. L. W. Robson (chairman) says that the trading accounts, though disappointing, must be considered in relation to the substantial implementation of the scheme for group concentration of all production facilities at Gloucester which was embarked upon nearly two years ago, and arising out of which the major physical movements have been made during the year under review. The new factory was handed over as a completed structure in August last year, and substantial quantities of heavy presses and ancillary production plant have now been moved from the other factories and are now practically completely installed. There was a shortfall in production arising out of the curtailed defence programme which led to a decision during the year to close the Croydon factory and transfer production to Gloucester. It is estimated that the trading results have been adversely affected to the extent of approximately £95,000 due to the costs of the concentration scheme. The recession in America has affected their North American companies, and in particular Permali Inc., the principal manufacturing unit, but the sales volume did increase during the year, although this increase was not adequate to cover the minimum operating expenses of the company. The company in Canada maintained its sales volume despite difficult trading conditions, and a small trading profit resulted. The first three months' trading of the current year has been adversely affected by the costs of carrying out the major part of the transfer to and installation of the Haddenham plant at Gloucester, involving attendant dislocation of "Hydulignum" production. However, under existing economic conditions orders for civil requirements are being maintained and as the year progresses the anticipated benefit of production economies should be achieved.

Colvern, Ltd., report a trading profit for the year to 31st March last of £161,783, as compared with £209,437 for the preceding year, and after providing £72,236 for taxation, the net balance is £64,197 (against £91,174). It is proposed to pay a final dividend of 12½ per cent, making 20 per cent for the year. The balance carried forward is £71,983 (against £76,936 brought in).

In his circulated statement, Mr. L. A. Reddall (chairman) says that during the year under review, while they have continued to receive a fair share of the greatly reduced national defence programme, the reduction in demand for their products in this field has to some extent been offset by increased sales in the commercial electronics and export markets. Trade continues at a satisfactory level and the board feels justified in enlarging its new building scheme to include further production space in addition to that for research as originally planned. An industrial development certificate has been granted by the Board of Trade and revised plans are now awaiting the approval of the Town and Country Planning Department.

E. K. Cole, Ltd.—The annual meeting was held on 24th July, Mr. E. K. Cole (chairman and managing director) presiding. In the course of his review of the year, the chairman said that turnover substantially increased largely due to the acquisition of Ferranti Radio & Television, Ltd., but owing mainly to the initial but non-recurring expenses of establishing and organising the commercial side of that business, the profit margin remaining was almost negligible. This fact, combined with sharply declining Government requirements for certain electronic equipment for the Armed Forces and the cost of their efforts to gain new export markets in the domestic field, accounted for the drop in trading profit during the year.

Domestic television and radio continued to contribute the largest proportion of their turnover and profit, but after a heavy demand throughout the autumn, budget fears affected turnover in the last three months. Radio and television were excluded from the Budget when other products were granted a reduction from 60 per cent to 30 per cent. The trade and the public were assuming an early reduction of purchase tax to 30 per cent and were, in many cases, holding off buying until that took place.

Their subsidiary, Egen Electric, Ltd., had made good progress in the manufacturing and marketing of radio and television components, and had a satisfactory year. Reduction in electronics development work for the Government had made available some of this effort for private venture work, on which there had been an encouraging increase in turnover. Work on reactor instrumentation still continued to prosper. They had installed and commissioned the nucleonic instrumentation for Lucas Heights in Australia and had supplied and installed similar instrumentation for the Pluto reactor at Harwell and the DMTR reactor at Dounreay. Further progress had been made in the development of nuclear measuring techniques in both the medical and industrial fields. A new phase of activities was the completion of the design of machine tool control equipment which was now in the production stage.

The subsidiary, Ekco Plastics, Ltd., had made further progress. Sales during the year exceeded those of the previous year and turnover kept pace with the order book; profit margins were, in the main, satisfactory.

They had continued their efforts in export markets and had maintained a considerable turnover. It was likely that they would have to extend their policy of shipping kits and component parts to their associates in countries where the importation of complete receivers was almost completely prohibited by tariff or import licence conditions.

Because of the mild weather, the anticipated substantial increase in turnover of heating equipment did not materialise. They had acquired the Warm-Glow Co., Ltd., one of the pioneers of electric blankets, and they were planning to obtain a useful share of this market.

Pena Industries, Ltd.—The first meeting of creditors was held on 23rd July when Mr. F. M. Collins, Senior Official Receiver, reported an estimated total deficiency of £1,328,858. Mr. Collins said that it was common knowledge that an investigation of the affairs of the companies in liquidation was being conducted by the police. For that reason he suggested that creditors should not ask questions. He proposed that an accountant should be nominated to act as liquidator of the company instead of the case being left with the Official Receiver. A statement of affairs showed assets estimated to realise £393,943. Liabilities were put at £879,100. The total deficiency might be increased by as much as £500,000 if contingent liabilities became admissible in the liquidation.

A resolution was passed for the appointment of Mr. I. C. Baillie, of Layton-Bennett Billingham & Co., chartered accountants, as liquidator, together with a committee of inspection.

Scottish Cables, Ltd.—An extraordinary meeting will be held on 11th August at which resolutions will be submitted for increasing the capital of the company and the issue of new ordinary shares. It is proposed to issue 2,083,335 new ordinary shares of 4s each to ordinary stockholders, by way of capitalisation of reserves, in the proportion of five new shares for every seven stock units of 4s each held. The proposed issue will absorb the unissued 83,330 ordinary shares. Although no further issue is at present contemplated, a margin of unissued capital is considered desirable, and it is therefore proposed that the authorised capital be increased to £1,550,000, which will leave 1,249,995

ordinary shares unissued after the capitalisation referred to above.

Geo. W. King, Ltd.—At the extraordinary general meeting held on 23rd July resolutions were passed increasing the authorised share capital to £1,000,000, converting unclassified shares into ordinary shares, converting existing "A" ordinary shares into ordinary shares, amending the memorandum of association of the company, adopting new articles of association, and approving the issue of 510,000 ordinary shares of 5s each by way of capitalisation of reserves.

Efco, Ltd. (formerly the Electric Furnace Co., Ltd.), reports a group profit for the year to 31st March last of £283,043, as compared with £226,840 for 1956-57, and after deducting £139,615 for taxation, the net balance is £143,428 (against £123,883). General reserve receives £100,000 and it is proposed to pay a final dividend of 10 per cent (against 8½ per cent), making 15 per cent (12½ per cent) for the year. The balance carried forward is £35,379 (against £47,586 brought in).

The Globe Telegraph & Trust Co., Ltd., reports net earnings for the year ended 30th June last of £517,480, as compared with £470,307 for 1956-57. Taxation charged is £425,739. General reserve receives £150,000, and it is proposed to pay a final dividend of 5½ per cent, again making 10 per cent for the year.

The Cables Investment Trust, Ltd., reports that after providing £308,391 for taxation, the net revenue for the year to 30th June last is £396,430 (against £382,260 for 1956-57). The dividend for the year on increased capital is maintained at 10 per cent by a final payment of 5½ per cent.

Mather & Platt, Ltd., are paying an interim dividend of 4 per cent (unchanged).

The British Oxygen Co., Ltd., has declared an interim dividend of 4 per cent (unchanged).

New Companies

Wandleside Warren Wire Co., Ltd.—We regret that in recording the registration of this company in our issue of 18th July, its title was incorrectly given as Wandleside Warrenware Co., Ltd.

N. W. Pearson, Ltd.—Registered 18th June. Capital £2,000. Electrical, mechanical, radio engineers, etc. Directors: N. W. Pearson, Mrs. Dorothy M. Pearson (secretary) and Marjorie E. Pearson. Regd. office: 60, Hockley Hill, Birmingham.

Pype Hayes Radio, Ltd.—Registered 18th June. Capital £2,000. Manufacturers of and dealers in radio and television sets, etc. Directors: H. R. Billings and Mrs. Andree I. Billings (secretary). Regd. office: 606, Kingsbury Road, Erdington, Birmingham, 24.

Remote Control, Ltd.—Registered 20th June. Capital £1,000. Manufacturers of and dealers in radio, electronic and remote control apparatus and equipment, etc. The subscribers are: M. A. L. Coote, electrical engineer, and R. H. Warring, design consultant. Solicitors: Hepburns, 203b, Rye Lane, S.E.15.

Martindill, Ltd.—Registered 20th June. Capital £5,000. Manufacturers of and dealers in domestic and industrial space heaters, etc. Directors: B. G. Martindill and Elsie M. Martindill and Eunice Bancroft. Secretary: Elsie M. Martindill. Regd. office: Salisbury House, E.C.2.

Diesel Generators, Ltd.—Registered 25th June. Capital £100. Diesel, mechanical and electrical engineers, manufacturers of and dealers in generators, turbines and generating equipment and apparatus, etc. Directors: A. G. Pincus (secretary), C. Robb and J. West. Regd. office: St. John's Works, Bedford.

Neon Service (Wales), Ltd.—Registered 25th June. Capital £100. Maintainers, servicers, erectors and manufacturers of metal, electric and other signs, etc. Directors: J. H. G. Pearce, C. H. Tucker, J. Scott and B. H. Pearce, all directors of Pearce Signs (Wales), Ltd. Secretary: F. W. Allen. Regd. office: 274, New Cross Road, S.E.14.

Aerofoil Heating, Ltd.—Registered 25th June. Capital £100. Manufacturers of and dealers in electrical goods, electrical and mechanical apparatus, etc. Directors: Violet H. Baldwin (secretary) and Mrs. Eva E. Colvin. Regd. office: Studio 2, 56, Wellington Road, N.W.8.

Woods Radio (Aylesbury), Ltd.—Registered 25th June. Capital £2,000. Manufacturers of and dealers in radio and television sets and equipment, etc. Secretary: D. H. C. Rixon. Regd. office: 43, Albert Street, Aylesbury.

Woods Radio (Tring), Ltd.—Registered 25th June. Capital £2,000. Other particulars are similar to those of Woods Radio (Aylesbury), Ltd.

J. Welton & Co., Ltd.—Registered 25th June. Capital £500. Electrical and mechanical engineers and manufacturers and workers of and dealers in electrical apparatus and goods, etc. J. G. Welton is the first director. Secretary: E. G. Welton. Regd. office: 10, Great Marlborough Street, W.1.

Spa Control Co., Ltd.—Registered 2nd June. Capital £1,000. Manufacturers and suppliers of all kinds of thermostatic controls, etc. Directors: C. W. Peters and Mrs. Sarah A. Peters. Regd. office: "Centaur Works," Back Dawson Terrace, Harrogate.

Liquidations

Harweb, Ltd., radio and electrical manufacturers, 21, King John Avenue, Portchester, Hants.—Winding up voluntarily. Liquidator, Mr. S. Cooke, Portland Chambers, West Street, Fareham, Hants, appointed 5th July.

F. Athey & Co., Ltd., electrical and radio engineers, 173, High Street, Winsford.—Winding up voluntarily. Liquidator, Mr. G. H. Eaves, 47, Mosley Street, Manchester, 2, appointed 14th July.

Tungsten Manufacturing Co., Ltd., electrical contact manufacturers, 8, Heddon Street, London, W.1.—Winding up voluntarily. Liquidator, Mr. K. R. Cork, 19, Eastcheap, London, E.C.3, appointed 10th July. Particulars of claims to the liquidator by 1st September.

Bankruptcies

L. D. Richards and **J. R. Richards,** formerly carrying on business in partnership under the style of Streatham Electrics, at 78, Upper Tulse Hill, Streatham, London, S.W.2, electrical contractors.—Public examination 3rd October at Bankruptcy Buildings, Carey Street, London, W.C.2.

G. F. Hedger, 80, Grenville Road, Plymouth, trading as Hedger & Greenway, electrical contractor, and formerly carrying on business in partnership with another at that address.—Public examination 3rd October at 4, Elliot Street, The Hoe, Plymouth.

G. W. Gould, formerly carrying on business at Hillington, Norfolk, as an electrical contractor.—Last day for receiving proofs for dividend 2nd August. Trustee, Mr. C. A. Taylor, 41, Sidney Street, Cambridge, Official Receiver.

E. H. Clegg, Brow Bridge, Greetland, near Halifax, electrical and television engineer.—First and final dividend of 1s 2½d in the £, payable at 36, North Parade, Bradford, 1.

D. Gillon, 52, Raynel Drive, Adel, Leeds, plumber and electrician.—First and final dividend of 11d in the £, payable on and from 12th August at the Official Receiver's office, 3rd Floor, Pearl Chambers, East Parade, Leeds, 1.

C. S. Smith, residing and lately carrying on business at 9, Pedder Street, Morecambe and Heysham, Lancs., electrical engineer and contractor.—Public examination 15th September at the Sessions Hall, Lancaster Road, Preston.

H. C. Kinsley, formerly carrying on business as an electrical engineer and contractor at 20, Waterloo Street, and 42, Queen Street, Market Rasen, under the style of North Lincs. Electrical Installations.—Last day for receiving proofs for dividend 5th August. Trustee, Mr. E. C. Stimpson, 27, Regent Street, Park Row, Nottingham, Official Receiver.

Forthcoming Events

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Thursday, 17th July, to Thursday, 27th September

CARDIFF.—Cardiff Castle. *Daily Telegraph* "Son et Lumière."

Thursday, 31st July, to Saturday, 11th October

GREENWICH.—*Daily Telegraph* "Son et Lumière."

Tuesday, 26th August

BIRKENHEAD.—Prenton Golf Course. Electrical Industries Golf Championship, Merseyside and North Wales Area Competition.

Wednesday, 27th August, to Wednesday, 3rd September

GLASGOW.—British Association for the Advancement of Science. Annual meeting.

Wednesday, 27th August, to Saturday, 6th September

LONDON.—Earls Court. National Radio and Television Exhibition.

Tuesday, 2nd September, to Thursday, 11th September

LONDON.—Olympia. Domestic Equipment Trades Fair.

Tuesday, 16th September, to Friday, 19th September

HARROGATE.—Association of Public Lighting Engineers. Annual conference.

Monday, 22nd September, to Saturday, 27th September

MANCHESTER.—City Hall. National Business Efficiency Exhibition.

Tuesday, 23rd September

LONDON.—Caxton Hall. A.S.E.E. Electrical Engineers Exhibition. Ballot meeting.

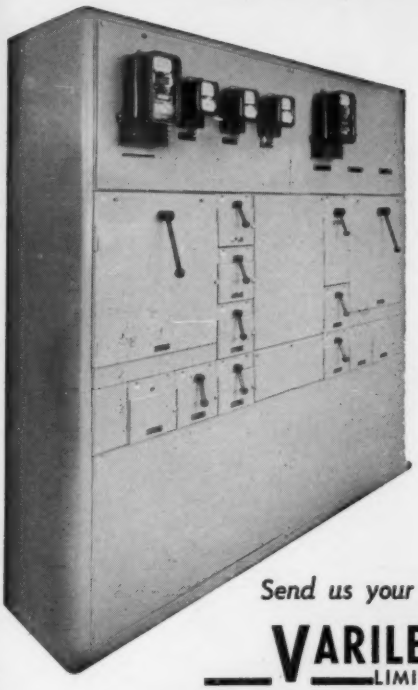
Wednesday, 24th September, to Friday, 3rd October

LONDON.—Olympia. Industrial Fuel Efficiency Exhibition.

Friday, 26th September, to Saturday, 4th October

LONDON.—Earls Court. Commercial Motor Show.

Cubicle Switchboards



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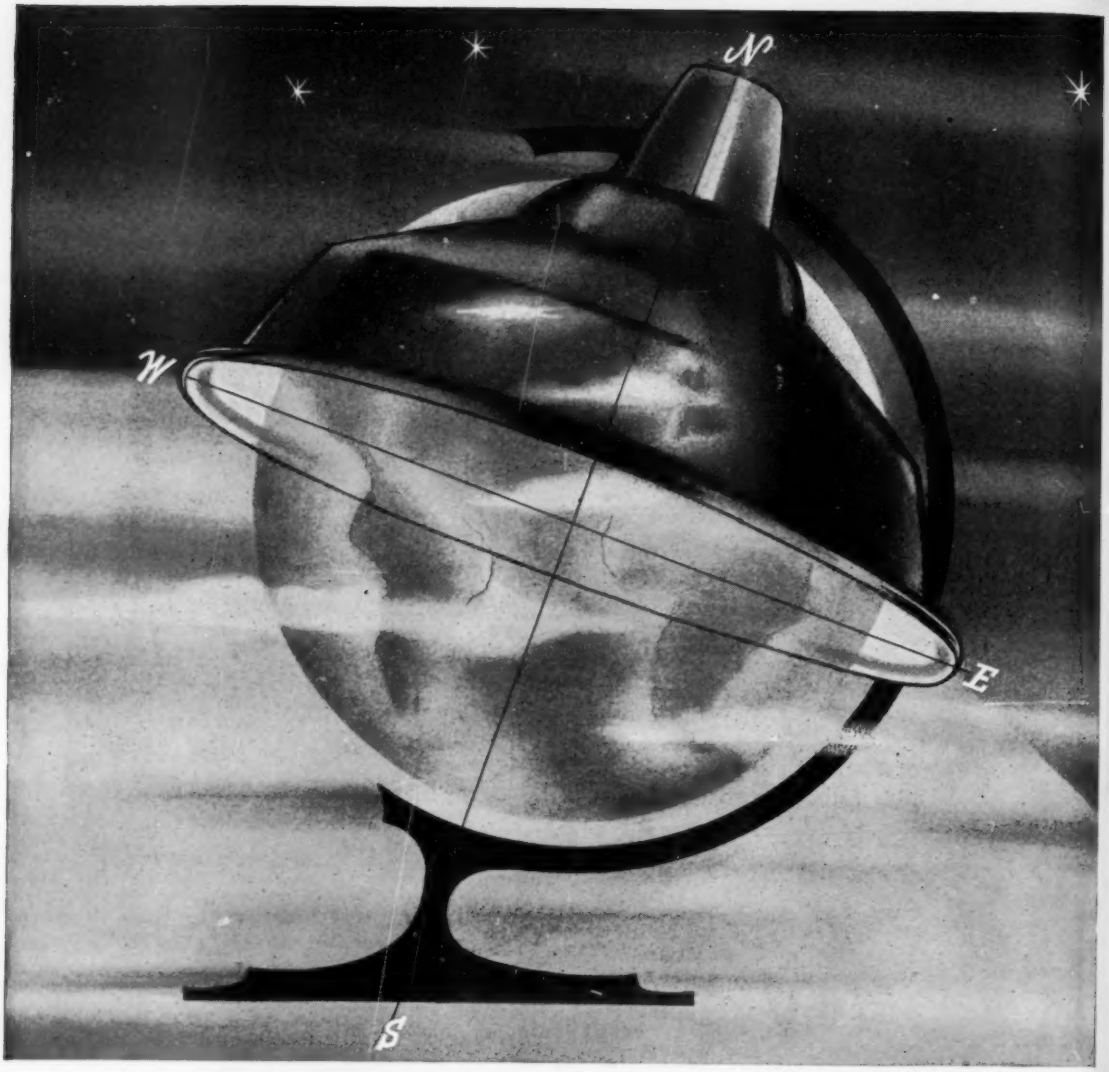

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

22912. British Broadcasting Corporation. —Automatic switching apparatus. 19th November, 1954. (798831.)

26659. Thorn Electrical Industries, Ltd. —Luminescent materials. 9th September, 1954. (798849.)

1954

7087. British Petroleum Co., Ltd., formerly Anglo-Iranian Oil Co., Ltd., Mann, F. H., and MacDougall, D.—Electrical logging. 11th March, 1954. (799041.)

24222. Fortiphone, Ltd.—Oscillation generators employing transistors. 23rd May, 1955. (798997.)

29090. Telephone Manufacturing Co., Ltd.—Conference circuit for private automatic telephone exchange systems. 8th September, 1955. (798904.)

35096. General Electric Co., Ltd., Jones, D. J., and Gossling, B. S.—Electric discharge devices. 28th November, 1955. (798945.)

35870. Wardray & Co., Ltd.—Electrical heater unit, primarily for removing thermoplastic insulation from conductors. 12th December, 1955. (799008.)

37194. Pye, Ltd.—Television receivers. 16th December, 1955. (798809.)

1955

2959. Mullard Radio Valve Co., Ltd.—Cathode-ray tubes. 30th September, 1955. (799108.)

3950. Teledictor, Ltd.—Pre-set timing appliance for use in conjunction with electrical apparatus. 24th April, 1956. (798833.)

4206. Smit & Co.'s Transformatoren-Fabriek N.V., W.—Tap changing switches provided with bridging resistances for regulating transformers. 11th February, 1955. (798870.)

4239. Tucker & Co., Ltd., J. H.—Means for locating and fixing switch mechanism and the like in hollow walls and panels. 13th February, 1956. (798871.)

4859. Telefunken Ges.—Synchronising circuits for television receivers. 18th February, 1955. (798773.)

5735. General Electric Co., Ltd.—Electroluminescent indicating devices. 24th February, 1956. (798795.)

10901. General Electric Co., Ltd.—Electric water heaters. 16th April, 1956. (799096.)

10977. General Electric Co., Ltd.—Electric apparatus. 16th April, 1956. (798986.)

12139. General Electric Co., Ltd.—Laminated magnetic core structures. 23rd March, 1956. (798880.)

12214. Radio Corporation of America.—System for reproducing signals from a magnetic medium. 27th April, 1955. (798948.)

12853. Hunt (Capacitors), Ltd., A. H.—Manufacture of electrical capacitors. 2nd May, 1956. (798963.)

13018. Murchie Trading Co., Ltd., and Fothergill, L.—Low sonic frequency crystal contact microphone. 3rd August, 1956. (798825.)

13103. General Electric Co., Ltd., Jenkins, G. H., and Parker, J. P.—Electric switch mounting arrangements. 7th May, 1956. (798987.)

13186. English Electric Co., Ltd.—Hydraulic reaction turbines. 4th May, 1956. (799013.)

13884. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Sealing conductors through glass-walled electron-discharge devices. 13th May, 1955. (799097.)

14480. Robertshaw-Fulton Controls Co. —Control mechanism for electric heaters. 19th May, 1955. (798988.)

15990. Mellor Bromley & Co., Ltd.—Electrical starting and stopping arrangements for knitting machines. 31st May, 1956. (Cognate application 31196, 1st November, 1955.) (798839.)

19252. Plessey Co., Ltd.—Construction of electrical apparatus. 8th August, 1956. (799015.)

19685. Crompton Parkinson, Ltd.—Protective or alarm circuits for electrically-driven machines. 28th August, 1956. (799016.)

23335. General Electric Co., Ltd.—Thermo-electric cooling units. 8th August, 1956. (798882.)

25136. Metropolitan-Vickers Electrical Co., Ltd.—Electrical spark-over protective devices. 28th August, 1956. (798873.)

27901. Standard Telephones & Cables, Ltd.—Focusing arrangements for cathode-ray tubes. 30th September, 1955. (798776.)

29247. Vickers-Armstrongs (Aircraft), Ltd.—Radio telescopes. 11th January, 1957. (798953.)

30895. Philips Electrical Industries, Ltd. —Photo-electric cells. 28th October, 1955. (798907.)

30903. Rank Cintel, Ltd., formerly Cinema-Television, Ltd.—Methods of manufacturing or restoring differently secondary emissive target electrodes for use in electron-discharge devices. 26th October, 1956. (798991.)

35856. Crabtree & Co., Ltd., J. A., and Wintle, T. D. G.—Auxiliary switches such as inching switches for electric motor starters. 29th October, 1956. (798999.)

35930. Sylvania Electric Products, Inc.—Colour television receiver. 14th December, 1955. (798957.)

36017. General Electric Co., Ltd.—Electric lighting arrangements for producing light resembling daylight. 12th November, 1956. (798884.)

36667. Robertshaw-Fulton Controls Co. —Thermostatic control device. 21st December, 1955. (798842.)

37267. General Electric Co.—Non-consumable inert gas welding electrodes. 29th December, 1955. (799000.)

1956

179. Compagnie Générale de Télégraphie sans Fil.—Delay lines for travelling wave tubes. 3rd January, 1956. (798931.)

181. Compagnie Générale de Télégraphie sans Fil.—Travelling wave tubes. 3rd January, 1956. (798932.)

218. Hunt (Capacitors), Ltd., A. H.—Manufacture of electrical capacitors and like components. 3rd January, 1957. (798778.)

1840. Marconi's Wireless Telegraph Co., Ltd.—Modulating circuit arrangements. 7th September, 1956. (799052.)

3456. Stone & Co. (Deptford), Ltd., J.—Battery charging arrangements. 1st February, 1957. (798937.)

3651. British Insulated Callenders (Submarine Cables), Ltd.—Method and apparatus for the treatment of sheet material. 5th February, 1957. (798807.)

3798. Philips Electrical Industries, Ltd.—Signalling systems for television. 7th February, 1956. (799100.)

5027. Metropolitan-Vickers Electrical Co., Ltd.—Nuclear reactors. 15th February, 1957. (799001.)

5827. Lehner, C. L. (trading as Fernsprech und Signalbau Lehner & Co. Komm.-Ges.).—Communication systems for mining installations. 24th February, 1956. (798815.)

6903. National Research Development Corporation.—Electrical digital computing engines. 26th April, 1957. (799078.)

7846. Sunbeam Corporation.—Electric cooking vessel and method of making same. 13th March, 1956. (798876.)

8064. Odenwald, A.—Thermostats. 15th March, 1956. (799002.)

8208. Compagnie Générale de Télégraphie sans Fil.—Aerials for metric, decimetric, or centimetric waves, of flat form and capable of being applied to flat surfaces. 15th March, 1956. (798821.)

10323. Philips Electrical Industries, Ltd. —Controllable inductances. 4th April, 1956. (799003.)

10795. Novel Products Corporation.—Remote-control electrical apparatus for positioning a load. 9th April, 1956. (799056.)

14876. Marconi's Wireless Telegraph Co., Ltd.—High frequency coaxial connectors. 22nd February, 1957. (798914.)

15143. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Switch assembly for electric cookers. 15th May, 1956. (799058.)

15312. Maschinenfabrik Oerlikon.—Single-phase transformer, more particularly for electric traction motors. 16th May, 1956. (799004.)

16276. Soc. Générale de Constructions Electriques et Mecaniques, Alsthom.—Cooling of dynamo-electric machines. 25th May, 1956. (798939.)

22555. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone exchanges providing automatic transfer service. 20th July, 1956. (Addition to 798749.) (798803.)

25693.—Siemens Schuckertwerke Akt.-Ges. —Electric surge arrestors. 22nd August, 1956. (798918.)

28739. Zeisel, M., and Kleeberger, F.—Electrically operated automatic roulettes. 20th September, 1956. (798879.)

29689. Standard Telephones & Cables, Ltd.—Diversity receiving combining radio system. 28th September, 1956. (799127.)

30972. Babcock & Wilcox, Ltd.—Steam generating and steam heating installations. 11th October, 1956. (799064.)

31299. Philips Electrical Industries, Ltd. —Electric switches, more particularly for high frequencies. 15th October, 1956. (798891.)

32278. Philips Electrical Industries, Ltd. —Electric plugs. 23rd October, 1956. (798899.)

32879. Erie Resistor Corporation.—Electronic component sub-assembly. 29th October, 1956. (798869.)

36381. Westinghouse Electric International Co.—Fluid-cooled metal-walled electronic devices. 28th November, 1956. (798994.)

37822. Mullard, Ltd.—Switching devices for stepping tubes. 11th December, 1956. (798823.)

38367. Ruben, S.—Reserve type electric dry cell. 17th December, 1956. (799104.)

38962. General Electric Co.—Electrical heating apparatus. 21st December, 1956. (798922.)

1957

4039. Pirelli Soc. per Azioni.—Underground high-tension electric cable systems. 6th February, 1957. (798996.)

8822. Amp, Inc.—Electrical connector. 18th March, 1957. (798924.)

9508. Standard Telephones & Cables, Ltd.—Fast-switching transistor telegraph repeater. 22nd March, 1957. (799094.)

30858. Compagnie Générale de Télégraphie sans Fil.—Travelling-wave tubes. 3rd January, 1956. (Divided out of 798931.) (798933.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Antrim.—County Education Committee. 14th August. Electrical installation in new primary school, Olderfleet, Larne. J. R. W. Murland, consulting engineer, 13, Wellington Place, Belfast.

15th August. Electrical installation in Ballycastle Grammar School. W. J. Ogle, consulting engineer, 63, Main Street, Bangor, Co. Down.

Australia.—Director, Stores and Contracts, P.M.G.'s Department, Melbourne. 11th September. Receivers and parts. (E.S.B. 18691/58. Ten/33729.)* 16th September. Capacitors. (E.S.B. 18755/58. Ten/33728.)*

Braintree and Bocking.—U.D.C. 13th September. Street lighting equipment. (See this issue.)

Burma.—Burma Purchase Board, Rangoon. 11th August. Electric lamps. (E.S.B. 18907/58. Ten/33746.)* Cable. (E.S.B. 18909/58. Ten/33742.)*

Cambridge.—City Council. 30th August. Electric lamps for one year. City engineer, The Guildhall.

Canada.—City of Regina. 11th August. Two 18/25 MVA transformers. (E.S.B. 18641/58. Ten/33695.)*

Dudley. — Corporation. Street lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 14th August. Telephone mobile motor generator. (E.S.B. 18479/58.I.C.A. Ten/33674.)*

India.—Mysore Government Stores Purchase Committee, Bangalore. 12th August. 33 kV and 11 kV lightning arrestors. (E.S.B. 18525/58. Ten/33667.)*

Madras State Electricity Board. 14th August. Fuse units and cutouts. (E.S.B. 18526/58. Ten/33668.)*

Hindustan Steel (Private), Ltd. 18th August. Switchgear and accessories. (E.S.B. 18850/58. Ten/33736.)*

National Coal Development Corporation (Private), Ltd., Calcutta. 18th August. Electric portable drills, battery charging equipment, grinding machines and combined welding and cutting blow pipes. (E.S.B. 18851/58. Ten/33734.)*

Damodar Valley Corporation, Calcutta. 19th August. 750 kVA power transformer. (E.S.B. 18848/58. Ten/33735.)*

Iran.—Plan Organisation. 7th September. Central electric power station for the town of Sarab. (E.S.B. 18559/58. Ten/33718.)*

Korea.—Government Office of Supply, Seoul. 11th September. Power plant for telephone exchange. (E.S.B. 18646/58.I.C.A. Ten/33710.)*

Kuwait.—Department of Electricity. 18th August. Skid-mounted mobile diesel alternator sets. (E.S.B. 18379/58. Ten/33657.)*

Letchworth. — U.D.C. 18th August. Street lighting equipment. Surveyor, The Council House.

Manchester.—City Council. 18th August. Electrical installation in Domestic and Trades College, Fallowfield. City architect, P.O. Box 488, Town Hall.

New Zealand.—G.P.O., Wellington. 18th August. Insulated cable and wire. (E.S.B. 18518/58. Ten/33670.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Pakistan.—Posts and Telegraphs Department, Karachi. 20th August. Underground cable. (E.S.B. 18699/58. Ten/33714.)* 25th August. Loading coils. (E.S.B. 18698/58. Ten/33727.)* 26th August. Armoured cable. (E.S.B. 18697/58. Ten/33713.)*

Rhodesia and Nyasaland.—Bulawayo Electricity Department. 20th August. Fluorescent street lighting fittings. (E.S.B. 18506/58. Ten/33659.)*

Central Supply and Tender Board, Lusaka. 5th September. Diesel-electric generating plant, ranging from 4 kVA to 100 kVA, and ancillary plant. (E.S.B. 18499/58. Ten/33660.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 13th August. Insulating tape. (E.S.B. 18431/58. Ten/33631.)* 15th August. Telegraph line material. (E.S.B. 18403/58. Ten/33662.)* Steam generators. (E.S.B. 18405/58. Ten/33636.)* Electric cable. (E.S.B. 18401/58. Ten/33634.)*

Union Tender and Supplies Board, Pretoria. 2nd October. Radio link equipment. (E.S.B. 18635/58. Ten/33716.)*

Sudan.—Department of Posts and Telegraphs, Khartoum South. 28th August. Polythene insulated and sheathed cable. (E.S.B. 18519/58. Ten/33706.)*

Uruguay.—Ministerio de Salud Pública. 26th August. Generators for X-ray apparatus. (E.S.B. 18754/58. Ten/33717.)*

Wandsworth. — Borough Council. 20th August. Two electric street cleansing trucks. (See this issue.)

ORDERS PLACED

London.—L.C.C. Accepted. Electrical installations in blocks 14 and 40 Brandon estate, Southwark (£4,278).—Halliday & Sons (Electrical), Ltd. Supply and installation of four electric meals lifts at new county secondary school, Islington (£3,444).—Elliston, Evans & Jackson (London), Ltd.

Newcastle-on-Tyne.—City Council. Street lighting equipment:—500 lanterns (£3,450).—G.E.C. 500 lanterns (£3,450).—Revo Electric Co. 500 Murray lanterns (£1,087).—Wardle Engineering Co. 240 cast-iron lamp columns (£2,769).—Revo Electric Co. 1,250 steel lighting columns (£10,151).—Stewarts & Lloyds.

Seaton Valley (Northumberland).—U.D.C. Electrical installations in 31 bungalows at Seaton Delaval, and 14 houses at Seghill.—J. W. Potts.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Atherstone.—Flats (67), Atherstone and Mancetter; R.D.C. architect, Atherstone, Warwickshire.

Atherton. — County secondary school, Everest Road/Gregory Avenue site; Lancs. county architect, Fishergate Hill, Preston.

Barking.—Houses (263), Thames View estate; borough architect, Town Hall.

Batley.—Bus station, Coulter's Yard; Yorkshire Woollen District Transport Co., Ltd., Head Office, Savile Town, Dewsbury.

Bedford.—Completion of Putnoe housing estate (£33,500); borough architect.

Bedlington.—Proposed private housing estate near Hartford Road (150 houses); William Leech, Ltd., contractors, St. James Street, Newcastle-on-Tyne.

Belfast.—Health centre, maternity and child health clinics, Lincoln Avenue, Antrim Road (£130,000); city surveyor, City Hall.

Brighton.—Flats (47), site of Albion Hill Homes, Finsbury Road; borough engineer, 26/30, King's Road.

Bristol.—Tea warehouse, Royal Edward Dock (£400,000); J. B. Bennett, city engineer, 470, Bath Road, Bristol, 4.

Carlisle.—Houses (60), Morton estate; city surveyor.

Chesterfield.—Bus depot, Sheffield Road (£710,274); borough engineer.

Chichester.—Works extensions for Beanstalk Shelving, Ltd.; A. Booker & Son, Ltd., builders, Walberton, Arundel.

Dorchester.—Kitchen block for County Hospital; Harding, McDermott & Partners, consulting engineers, 18, Doughty Street, London, W.C.1.

Durham.—Oriental museum at Elvet Hill for Durham University (£60,000); Gradon & Son, builders, North Road, Durham.

Health centre at Peterlee; Gregory & Partners, electrical consultants, 135, Pilgrim Street, Newcastle-on-Tyne.

Easington.—Bungalows for old people (485), for the R.D.C.; R. R. Lumsden, surveyor.

Exeter.—Showrooms and offices, High Street; Ruislip Development Co., Ltd., 56, Grosvenor Street, London, W.1.

Gateshead.—Factory additions, Team Valley estate, for the Armstrong Cork Co.; Middleton & Co., builders, West Sunniside, Sunderland.

Gosport.—Office block; Hants & Dorset Motors, Ltd., West Street, Fareham.

London.—Dwellings (91), Woodland Road area, Camberwell; borough architect.

Office block, Houndsditch and Camomile Street, E.C.; F. G. Minter, Ltd., builders, 4, Buckingham Gate, S.W.1.

Rebuilding of St. Paul's Church, Hall and Vicarage, Walworth; Woodroffe, Buchanan & Coulter, architects, 5, Bedford Row, W.C.1.

Luton.—Block of shops and maisonnettes, Dewsbury Road/Birdsfoot Lane; director of housing, Town Hall.

Manchester.—Church of St. Francis, Newall Green, Wythenshawe; Basil Spence & Partners, architects, 48, Queen Anne Street, London, W.1.

Merthyr Tydfil.—Additional 300 houses on the Gurnos estate; D. C. W. Jones, borough engineer, Town Hall.

Rugeley.—Houses (151), Ravenhill estate, Brereton; E. J. James, surveyor, Council House.

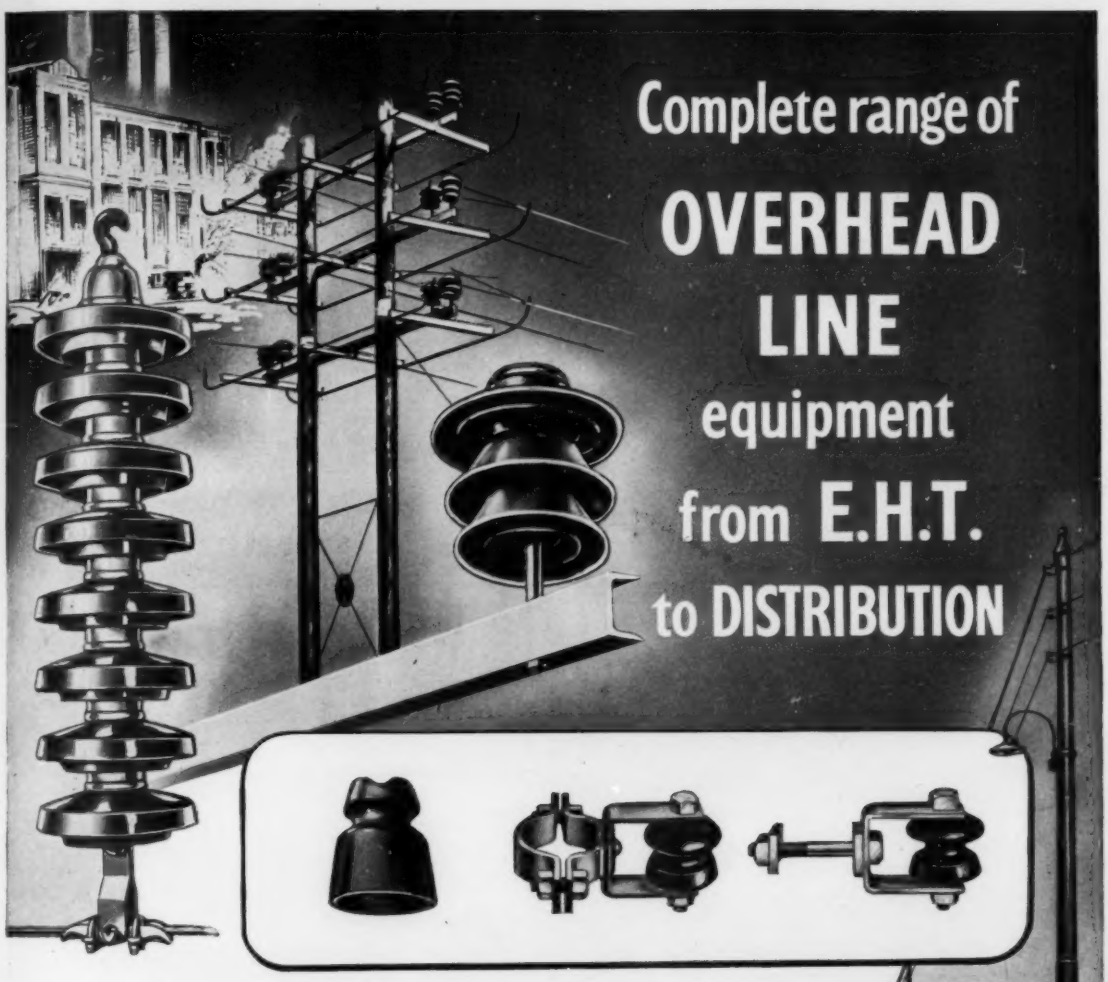
Scunthorpe. — Three-storey hardware premises, 163, High Street; secretary, Scunthorpe Co-operative Society, Ltd., 180-2, High Street.

Seaton Valley.—Bungalows (31), Westbourne estate; A. R. Robertson, Ltd., builders, East Park View, Blyth.

Sunderland. — Extensions to Central Library, Art Gallery and Museum (£31,000); borough architect, Grange House, Stockton Road.

Wellington (Salop).—Private development of Brookland estate (376 houses); Fletcher Estates (Harlescott), Ltd., Harlescott, Shrewsbury.

West Hartlepool.—Houses (500), Owton Manor estate; A. G. Sinclair, borough architect.



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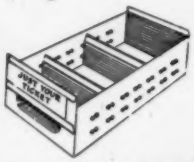

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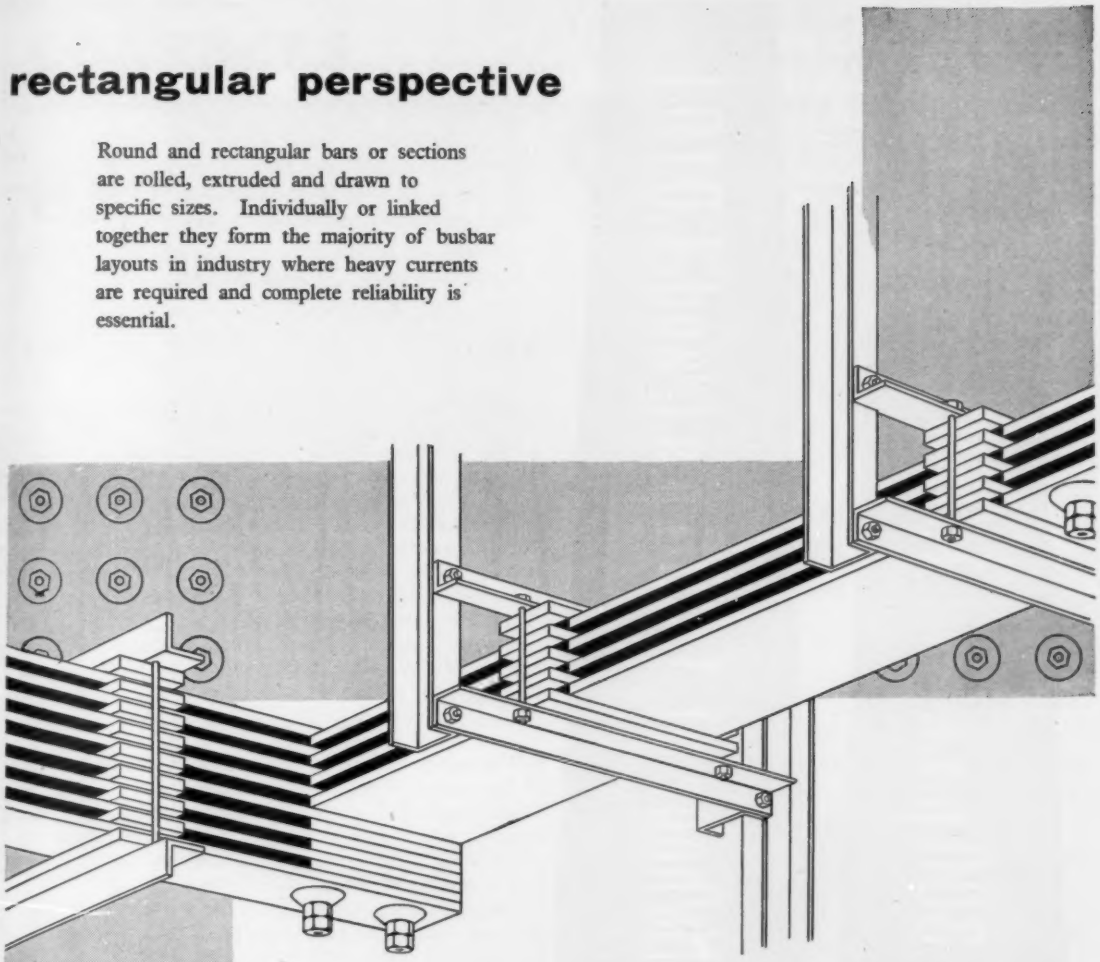

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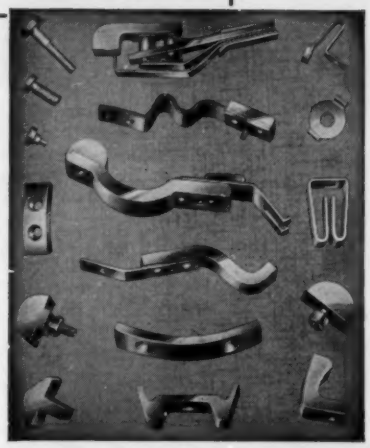

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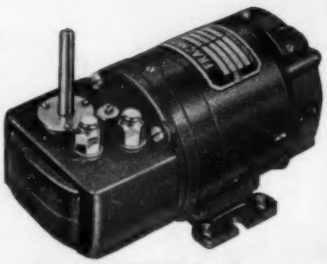

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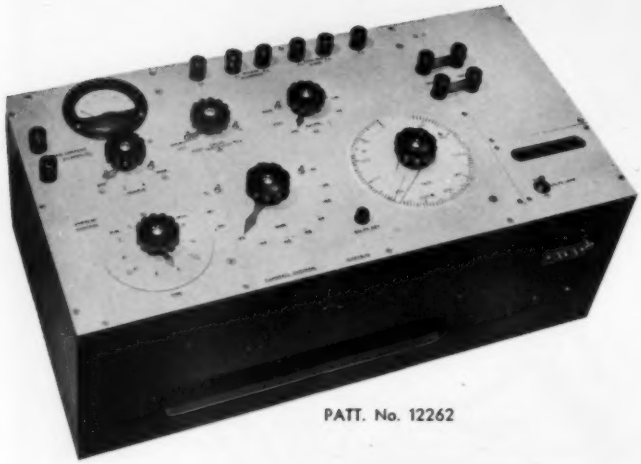

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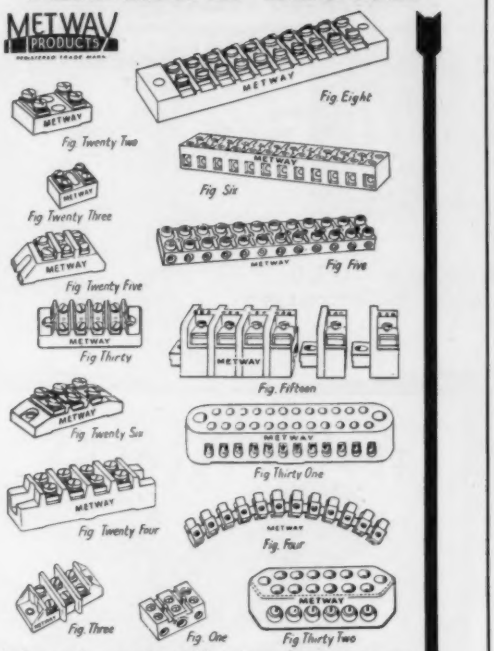

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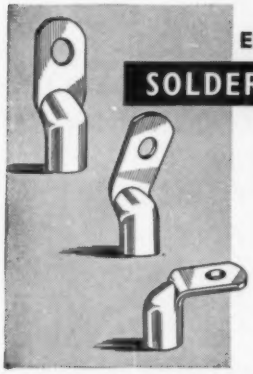

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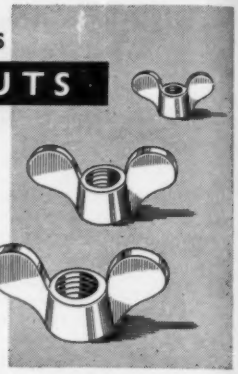

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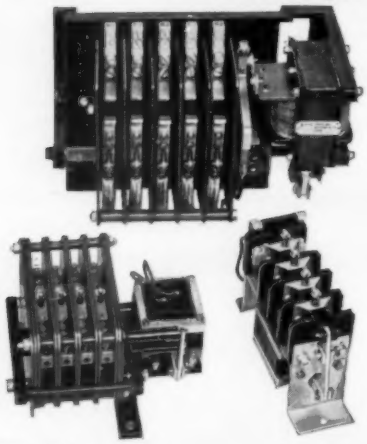

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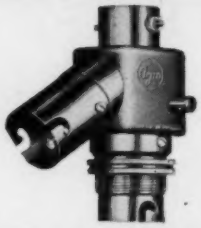

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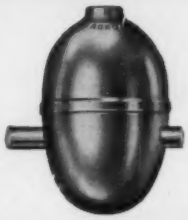

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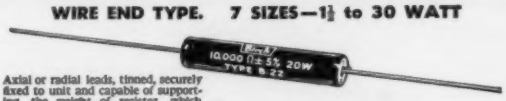

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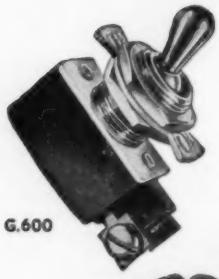

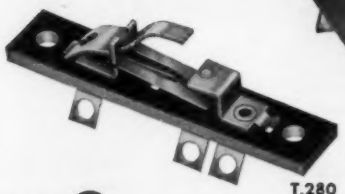

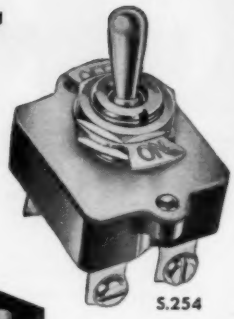

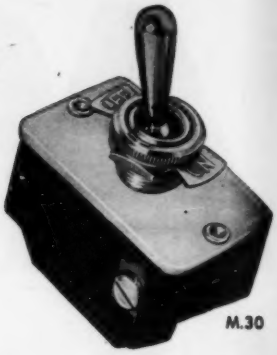

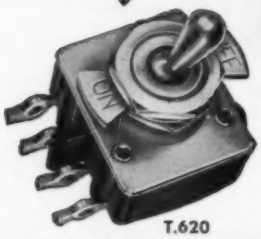

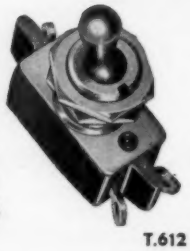

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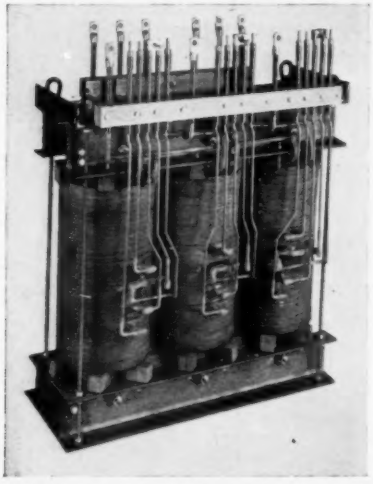

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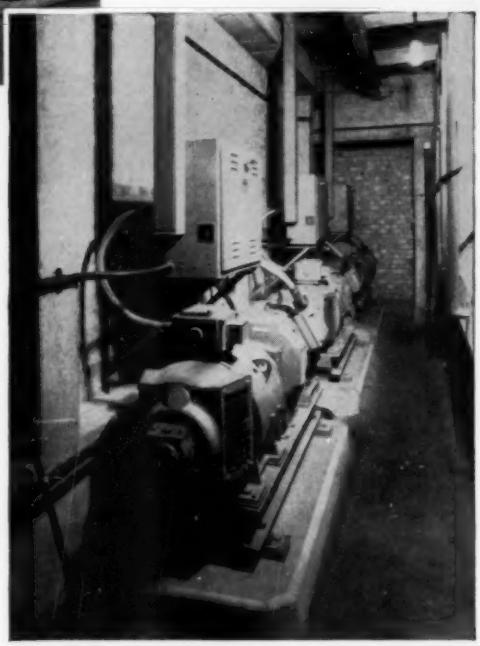

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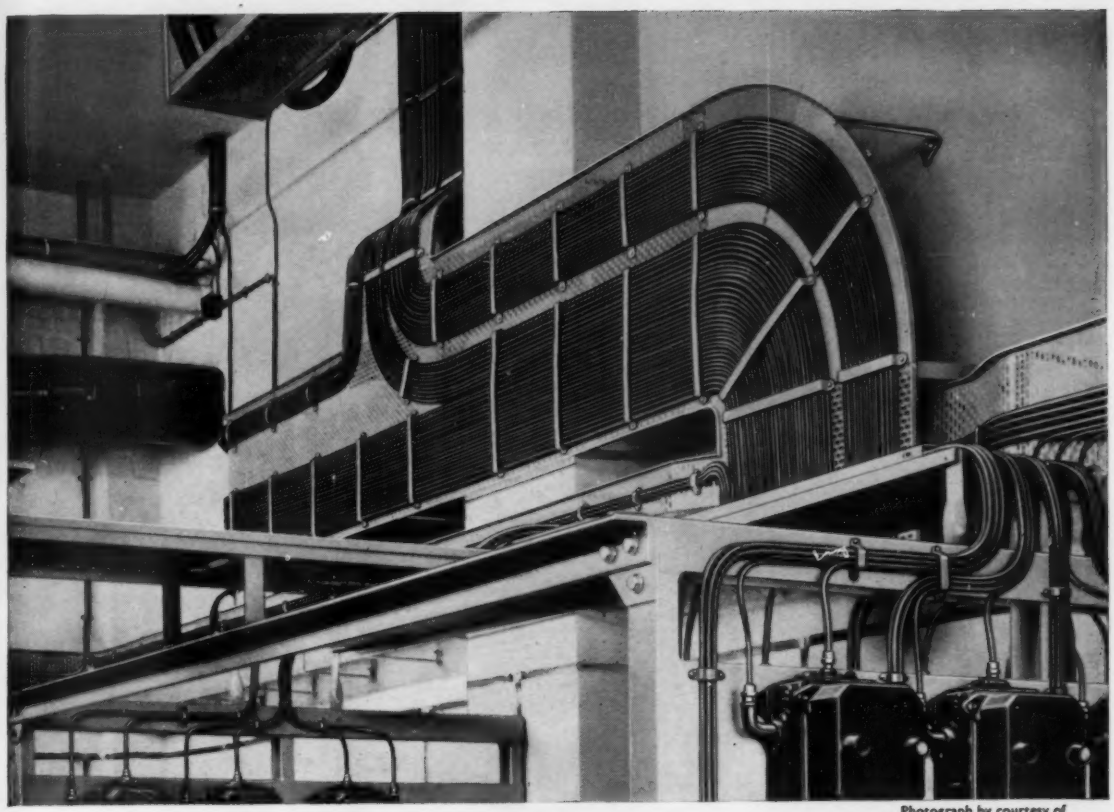

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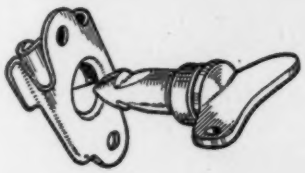

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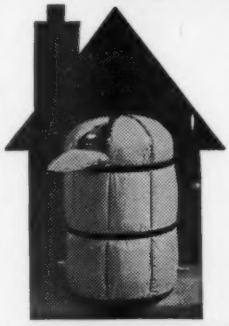

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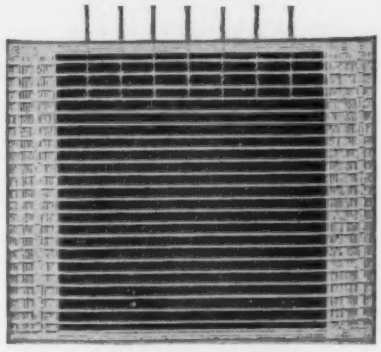

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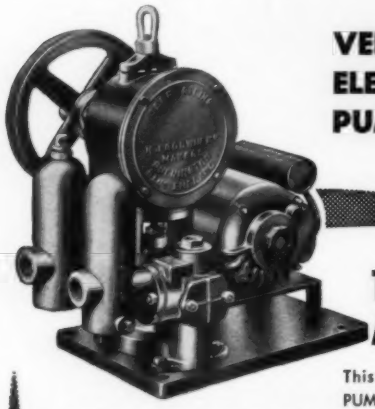

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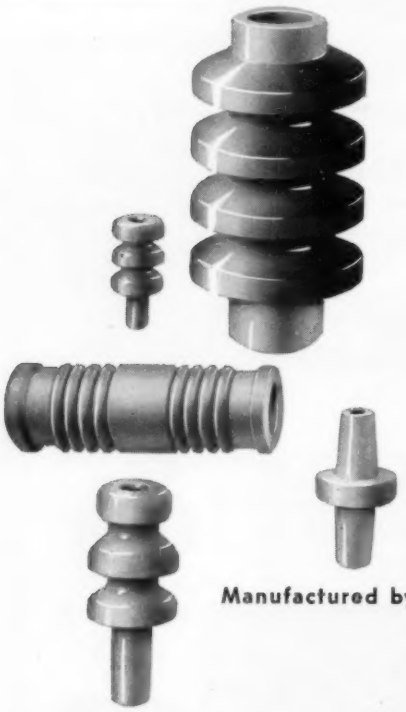

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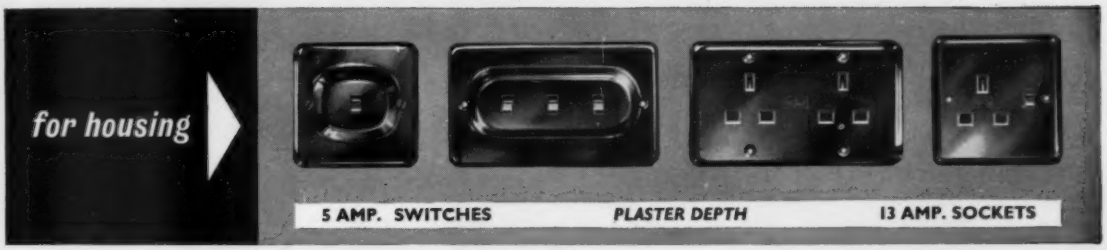

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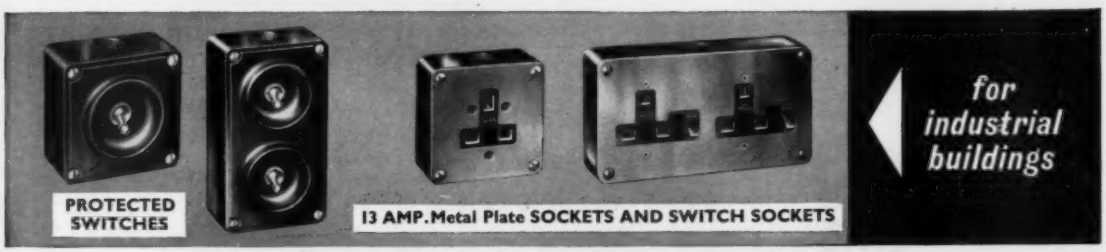

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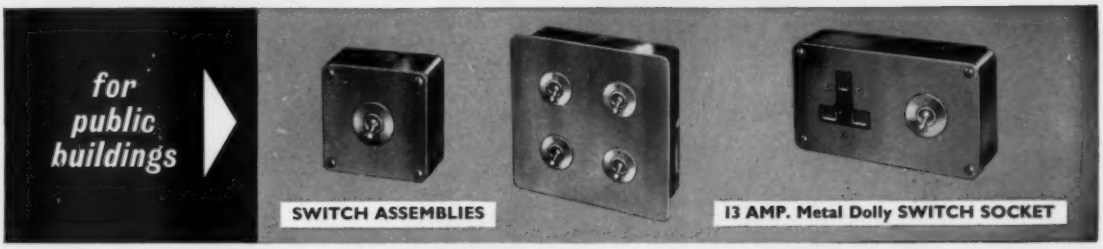
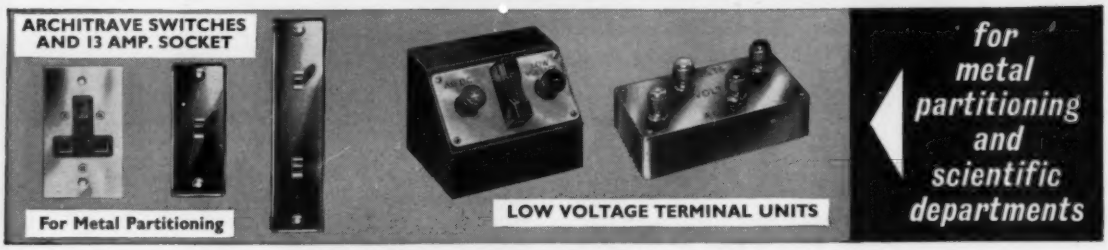


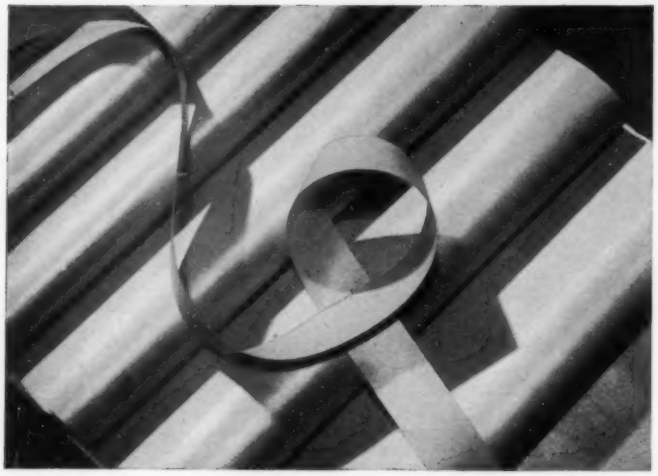
... approved by Contractors everywhere


ARCHITRAVE SWITCHES AND 13 AMP. SOCKET
For Metal Partitioning
LOW VOLTAGE TERMINAL UNITS
for metal partitioning and scientific departments

For further details send for 1957/58 Edition Catalogue.

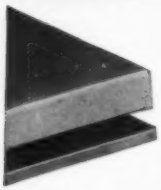
VOLEX ELECTRICAL PRODUCTS LTD.

Telephone : PENDLETON 4373 SALFORD 6 Telegrams : VOLEXPROD. Salford 6



DIELECTRIC PLUS

Insulating cloths and tapes manufactured by IOCO LIMITED provide the necessary dielectric strengths appropriate to various classifications. In addition they possess properties of thermal stability, mechanical strength, moisture resistance, flexibility, toughness and minimum bulk which fit them for service under almost any conditions in any part of the world. Full technical literature will be sent on request.



FORMAPEX

Laminated plastic boards and sheets, paper or fabric based, are used widely for terminal boards, switchgear, rigid insulation, etc.

For Tropical Conditions

LINAPOL *glass fabric or Terylene coated with polyurethane resin. Class 'F' and 'E' insulants with great flexibility, extensibility, surface toughness and resistance to moisture.*

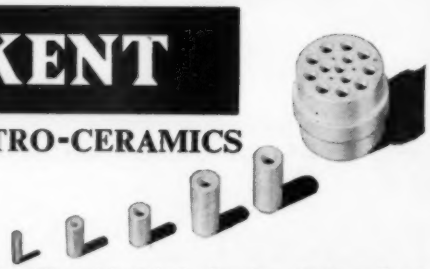
IOCO LIMITED

Anniesland Glasgow W3 Telephone: Scotstoun 5501-6

Low Tension — Refractory — Kenlosite (Sintered Alumina) and Cordent (cordierite bodies) Electrical porcelains supplied to standard design or to your special requirements. Enquiries on all electro-ceramics are welcome. 'Phone or write for illustrated brochure.

KENT

ELECTRO-CERAMICS



William Kent (Porcelains) Ltd., Burslem, Stoke-on-Trent

Tel.: Stoke-on-Trent 84237/8/9 'Grams: "KENELEC, Stoke-on-Trent"

TRANSFORMERS of all types up to 25 kVA for Single or Three Phase operation, Phase Conversion, etc.

INDUCTA

COILS for Contactors, E.M. Brakes, Air Valves, etc. and COIL WINDINGS for all purposes.

MAINS Output, and Special Purpose Transformers for Radio Equipment, Chokes, etc.

SOLENOIDS for A.C. and D.C. Operation A.I.D. APPROVED

W. F. PARSONAGE & Co LTD

INDUCTA WORKS

PARK RD BLOXWICH WALSALL

TELEPHONE: BLOX. 66464

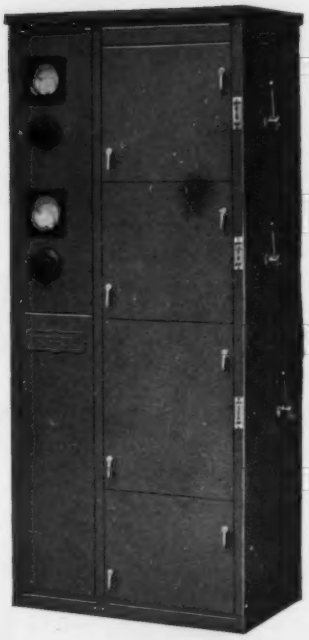
Studding · Studs · Allthreads · Tie Rods

TELCO LTD., 3 Newman Street, London, W.1 MUSeum 5701/4

AEROFLEX
Fluvent

POWER PILLARS

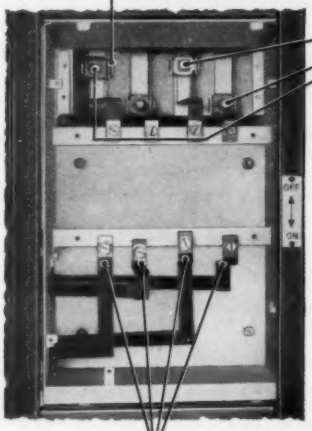
440 VOLTS 46 K.A. BREAKING CAPACITY (440 A.C.5)



These Pillars represent a revolutionary design of main Fuse-Switch Distribution Board in which the maximum complement of Fuse-Switch circuits can be grouped on a common busbar distribution system, in as confined a space as is consistent with adequate cabling and access facilities. Fluvent Power Pillars can be supplied in many forms embodying particular combinations of ways, and including current transformers and metering features. They can be mounted side by side leaving suitable end clearance for the operation of switch handles and the busbars of the Pillars are coupled together by horizontal trunking at floor level which means that a switchboard of large scope can be built for mounting in limited space.

Back busbar chamber exposed by removing fuse-switch chasses and connector bushing plate.

General purpose saddle clamps securing covered inter-connections from fuse-switch to busbars.



Covered inter-connectors from fuse-switch to cable terminals, in separate cable-way side chamber.

Aeroflex

ENERGY LIMITING HIGH BREAKING CAPACITY REWIREABLE CARTRIDGE FUSE-LINKS

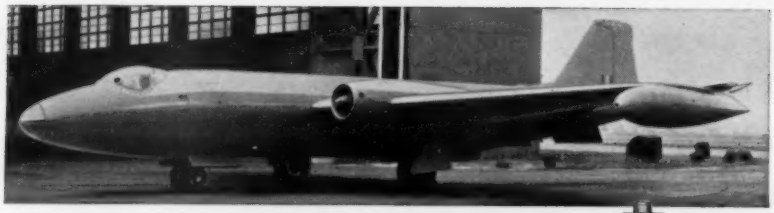
are now supplied in all standard Aeroflex-Fluvent Distribution Boards, Fuse-Switches and Switchboards, including Fluvent Power Pillars. The fuses comply with BS.88-1952 Cat. 440 AC5 Class P. Standard fully wired cartridge fuse-links are included unless otherwise specified when appropriate underwirings can be fitted.

Parmiter Hope & Sugden Ltd.

FLUVENT ELECTRICAL WORKS LONGSIGHT MANCHESTER 12

London: 34 Victoria Street, S.W.1. Glasgow: 5 Somerset Place, C.3. Birmingham: 39/41 Carrs Lane, 4.

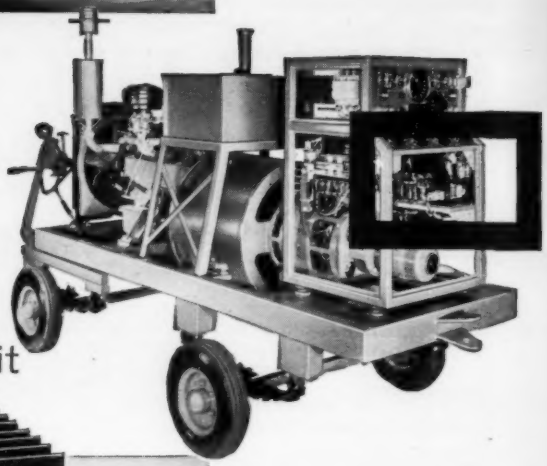
dmPH1144

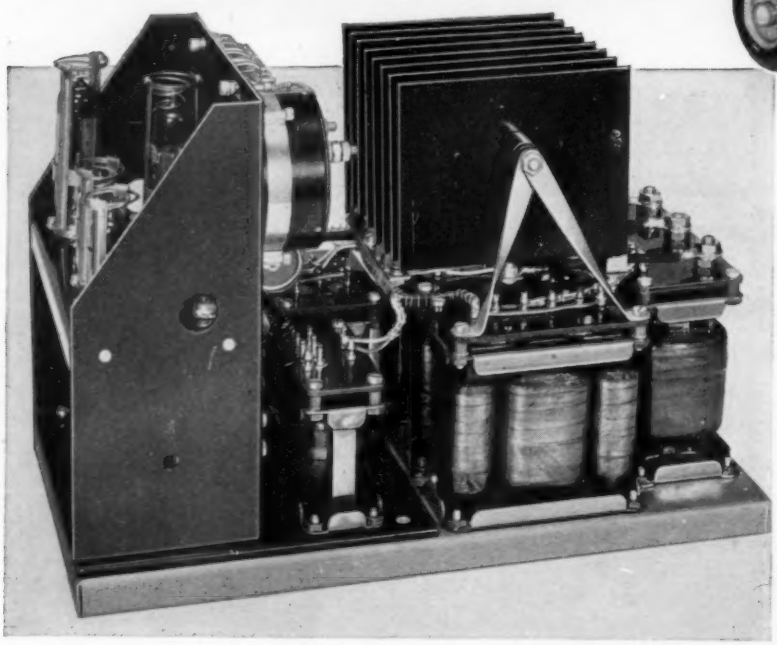


G.E.C.

Germanium Rectifiers

for the Houchin "Hy-Cy" Aircraft Ground Supply Unit





The basic GEX 541 is a germanium junction diode. Single units are available for such applications as D.C. blocking and gating. Complete rectifier stacks can be supplied, finned or unfinned, suitable for currents up to 160 amps. or D.C. output voltage of up to 900 volts.

For the Houchin Energiser, rectifier size is of paramount importance. And the new GEX 541 rectifier stack gives a 60% reduction in volume compared with conventional type of rectifiers.

The new GEX 541—chosen by Houchin for lightness

Germanium rectifiers are the lightest type of rectifier available for the application and the stack installed in the Energiser weighs only 10% of the equivalent conventional rectifier.

The new GEX 541—chosen by Houchin for efficiency

The GEX 541—in common with all germanium rectifiers in the G.E.C. range—offers low forward resistance and corresponding increases in efficiency and regulation.

For Data Sheets and further information, write to the Valve and Electronics Department.

THE GENERAL ELECTRIC CO. LTD · MAGNET HOUSE · KINGSWAY · LONDON · W.C.2.

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

URBAN DISTRICT COUNCIL OF BRAINTREE AND BOCKING

Street Lighting: Group "B"

TENDERS are invited on a FIXED PRICE basis (that is, without cost variation clauses for labour and materials) from contractors experienced in the above work for :—

1. the supply and erection of
   - 214 Group "B" Prestressed Concrete Columns ;
   - 233 60-watt Sodium Vapour Enclosed Lanterns ;
   - 22 100-watt Filament Open Lanterns ;
   - 31 Conversion Brackets for existing columns ;
2. the laying of 800 yards of ducts across carriageways ;
3. the taking down of 108 existing columns with overhaul and re-erection of 35 ;
4. and incidental works.

Plans, conditions of contract and other documents may be inspected at the office of the Engineer and Surveyor, Town Hall, Braintree, from whom specification, bills of quantities and tender forms may be obtained upon payment of a deposit of £2 2s., which will be refunded upon the receipt of a bona fide tender and all documents.

Tenders in a plain sealed envelope endorsed "Tender, Street, Lighting," must be addressed to the Clerk of the Council and delivered to the Town Hall, Braintree, before 12 noon on Saturday, the 13th September, 1958, together with priced bills of quantities and specification in a separate envelope bearing the tenderer's name and address.

The Council do not bind themselves to accept the lowest or any tender.

W. BALSON,
Town Hall, Clerk of the Council.
Braintree, Essex. 4312

COUNTY BOROUGH OF DUDLEY

Street Lighting: Second Year Programme

APPLICATIONS to tender are invited for the above contract which provides for an improved Lighting Installation on various roads within the Borough.

The work consists of the provision and erection of 112 Group "A," 410 Group "B" Stanton prestressed concrete columns, 38 Group "A" tubular steel columns, and 19 wall mounted lighting points with Sodium, Mercury and Fluorescent lamps, together with all necessary lanterns and control gear.

Applications must be submitted to the Borough Engineer, The Council House, Priory Road, Dudley, together with a deposit of £5 5s., which will be returned on receipt of a bona fide tender, not subsequently withdrawn, and the return of all documents.

The latest date for the receipt of applications is Friday, 15th August, 1958, and tender documents will be forwarded as soon as possible after that date.

P. D. WADSWORTH,
The Council House, Town Clerk.
Dudley, Worcs.
24th July, 1958. 4342

CLASSIFIED ADVERTISEMENTS ARE PREPAID

METROPOLITAN BOROUGH OF WANDSWORTH

Electric Trucks

TENDERS invited for supply and delivery of two Rider Type Electric Street Cleansing Trucks.

Tender documents, from the Borough Engineer, must reach me by 10 a.m. 20th August, 1958.

R. H. JERMAN,
Municipal Buildings, Town Clerk.
London, S.W.18. 4341

SITUATIONS VACANT

FEDERAL POWER BOARD OF RHODESIA AND NYASALAND

APPLICATIONS are invited for the following appointments:—

TRANSMISSION ENGINEER.
Salary £2,500 p.a.

PROTECTION AND TELECOMMUNICATIONS ENGINEER.
Salary £2,250 p.a.

ASSISTANT ELECTRICAL CONSTRUCTION ENGINEER. Salary £1,750 p.a.

The board is at present constructing at the Kariba Gorge on the Zambesi a large dam and power station having an initial capacity of 600 MW and an ultimate capacity of, at least, 1,200 MW. It is also constructing about 930 miles of 330 kV transmission line to connect the Kariba power station with a number of thermal stations in the Federation.

Applicants for the post of transmission engineer should be fully qualified transmission engineers. Duties will be connected with the design, construction and maintenance of high voltage transmission lines and some aspects of maintenance in the Board's substations.

For the post of protection and telecommunications engineer applicants should be fully qualified and have a good knowledge of plant and transmission system protection. Duties will be connected with the installation and operation of protective gear in the Board's power station and substations and will involve other light electrical equipment including metering, telephone, telegraph, voice frequency and carrier communication equipment.

Applicants for post of assistant electrical construction engineer should be qualified engineers or graduates with experience in an engineering works or in the power supply industry. Duties will be to assist the Board's electrical construction engineer with the designing, construction and installation of electrical and mechanical plant.

All posts are subject to the Board's service and leave rules and successful applicants will be required to join the Board's pension fund.

Applications should be posted so as to reach the Secretary, Federal Power Board, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 1st September, 1958. 4133

DEVELOPMENT LABORATORY ENGINEERS

MORPHY-RICHARDS LTD.
St. Mary Cray, Kent

require 4 Laboratory Engineers for an expanding department engaged in the design and development of electrical appliances. Commencing salary up to £950 p.a. depending upon experience and qualifications. Benefits include profit sharing bonus and pension scheme.

Qualified engineers with experience in light electrical/mechanical industry are invited to write or telephone—P. D. Nunn (Orpington 27000). 4349

8th AUGUST ISSUE

ADVERTISEMENTS for the above issue have now closed for press

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division:—

SECOND ASSISTANT ENGINEER (Mechanical),
GENERATION (Construction) DEPT.,
SPONDON "H" POWER STATION
SITE (Vacancy No. 112/58/ER).

Applicants should have had a fundamental training in mechanical engineering including workshops, together with experience in the manufacture and erection of heavy mechanical plant as installed in a modern power station. It would be an advantage for candidates to have a University degree or equivalent qualification in mechanical engineering.

The salary will be in accordance with Schedule B, Class AX/EX, Grade 4 (£1,145-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th August, 1958.

SHIFT CHARGE ENGINEERS,
DRAKELOW "B" POWER STATION
(Vacancy No. 113/58/ER).

Candidates should have had a sound technical training and considerable experience in a large modern power station. Preference will be given to candidates who possess qualifications admitting to Corporate Membership of the Institution of Electrical and/or Mechanical Engineers, and a knowledge of pulverised fuel firing will be an advantage. The ultimate capacity of the station will be 480 MW.

Salary will be in accordance with Class J, Grade 6 (£1,160-£1,235 per annum) of the National Joint Board Agreement plus 10% allowance for shift duties.

Closing date for receipt of applications, 7th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEER, CASTLE DONINGTON POWER STATION
(Vacancy No. 120/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,160-£1,235 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 13th August, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE.6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

DIVISIONAL CONTROLLER.
23rd July, 1958. 4323

Situations Vacant (continued)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Board Headquarters

SENIOR ASSISTANT
(Commercial Department)
(Halesowen).

Applicants should have a wide practical knowledge of electrical equipment and applications, and of competitive products, and of all aspects of modern marketing techniques, and sales management, including research and analysis, forecasting, budgeting, organisation and control; proficiency as a public speaker would be an advantage. Salary in accordance with N.J.B. Schedule B, Grade 2AX/EX, £1,435/£1,700 per annum.

Applications giving full details of age, qualifications, experience, present position and salary should be forwarded within 14 days to the Secretary, Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham.

Worcester and District Sub-Area

THIRD ASSISTANT DISTRICT
COMMERCIAL ENGINEER
(Redditch and Bromsgrove District).

Applicants should have had a sound technical training with wide practical experience in the sale and installation of domestic and commercial electrical equipment and the work associated therewith. The successful applicant will be required to assist in all branches of commercial work, including advising consumers on domestic, commercial and industrial equipment, estimating and contracting work. Technical qualifications desirable. Salary £740/£785 per annum (N.J.B. Grade F.10).

Apply by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary. 4345

SALES AND CONTRACTS ENGINEERS

Meters, Relays and Instruments

ENGLISH ELECTRIC

Stafford

THE company wishes to appoint a number of young engineers having an interest in commercial engineering at the Stafford Works Relay or Instrument Sales Departments. As and when vacancies occur there will be opportunities for later transfer to the staff of the company's branch offices at home and abroad, providing a sales and technical advisory service to customers.

Applicants should have obtained or be in process of securing their H.N.C. (E.) or equivalent qualification.

Please write to Dept. C. P. S., Marconi House, The Strand, London, W.C.2, quoting reference ER.1212P.

4302

WATCHMAKERS/
WATCH REPAIRERS
are required to repair small delicate mechanisms in the Instrument Department of a large chemical works.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4249

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER,
Croydon and Purley District.

Salary £1,375 to £1,465 per annum, including London Area allowance under N.J.B. Agreement, Class H, Grade 3. Superannuable. Croydon and Purley is a major district with 130,000 consumers, 8 showrooms and a large repair workshop. Candidates should have good technical and personal qualifications, and must be fully experienced in all aspects of district commercial work.

Applications, naming 2 referees, on forms from Croydon and Purley District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 20th August, 1958.

EDITORIAL ASSISTANT,
Staff Magazine, Secretary's Dept.

Salary £855-£930 p.a., under N.J.C. 5. Superannuable. Applicants must be experienced in sub-editing, reporting and staff magazine make-up and layout and in the preparation of feature and news articles. Knowledge of the electricity supply industry will be an advantage. The successful applicant will be required to interest himself in and carry out work related to the Board's other welfare activities.

Applications, giving details of age, education and experience, and the names of 2 referees, to Secretary, SEEBOARD, 10, Queen's Gardens, Hove, Sussex, by 20th August, 1958.

DEMONSTRATOR,
Medway District.

Salary £615 × £20 to £675 p.a., under N.J.C. Grade 2. Superannuable. Applicants should have a diploma or certificate for domestic science, also E.A.W. certificate. Duties include lecturing, demonstrating, advising consumers and generally assisting in any of the District showrooms.

Applications, naming 2 referees, to Medway District Manager, SEEBOARD, Gardiner St., Gillingham, by 13th August, 1958.

G. WRAY,
Secretary. 4358

CHINA LIGHT & POWER CO. LTD.
Kowloon, Hong Kong

ASSISTANT ENGINEER,
DISTRIBUTION DEPARTMENT

APPLICATIONS are invited for the above position from suitably qualified engineers, age preferably not exceeding thirty-five.

Applicants should preferably hold a Corporate or Graduate Membership of the Institution of Electrical Engineers, or equivalent qualifications, and have sound theoretical training and practical experience in the installation and maintenance of high and low voltage underground and overhead mains, static substation plant and distribution equipment.

Basic salary and expatriation pay will be approximately £1,770 p.a., payable in Hong Kong dollars, plus a variable cost-of-living allowance ranging from £60 p.a. for a single man to £430 p.a. for a married man with children. Income tax is low in the Colony. First-class unfurnished quarters are provided free and also free passages to and from the Colony, together with generous home leave on full pay and cost-of-living allowance.

The company also has a provident fund and retirement scheme.

Applicants should write in the first instance to Box 4357, c/o Electrical Review, giving fullest details of education, qualifications, experience, age, marital status, and the date available for leaving the U.K. Arrangements will then be made for suitable applicants to be interviewed in the U.K.

ATTRACTIVE VACANCY
occurs for
OUTSIDE SALES ENGINEER
with good technical training and experience in the sale of
Electrical Plant comprising
Transformers.
Switchgear.
Rotating Machines.

Remuneration £1,250/£1,650 per annum to a suitable applicant, preferably with a connection in Birmingham area.

Write, in first instance, giving details of experience to—Box No. 4314.

N.B.—All applications will be treated in strict confidence.

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

APPLICATIONS are invited for the following positions in the System Development Section of the Technical Department at Headquarters, Moseley, Birmingham.

(a) THIRD ASSISTANT ENGINEER (Vacancy Number 838MD). N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 6, commencing at a point commensurate with qualifications and experience within the range £895-£1,020 per annum ultimately rising to £1,140.

(b) FOURTH ASSISTANT ENGINEER (Vacancy Number 839MD). N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 8, commencing at a point commensurate with qualifications and experience within the range £710-£835 per annum ultimately rising to £935.

Applicants for (a) should possess qualifications equivalent to Graduate I.E.E. and should have had practical training either in the supply industry or with a switchgear manufacturer. They should also have held a position involving transmission system planning and should have a sound knowledge of the calculations involved and of the design and operation of such systems. Applicants for (b) should have had experience either in the supply industry or with a switchgear manufacturer and a knowledge of the calculations involved in the development and operation of power systems will be an advantage. Technical qualifications up to Graduate I.E.E. standard are desirable.

Apply, quoting the respective vacancy number on form AE6, to the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 14th August, 1958. 4237

BIRMINGHAM TAME AND REA DISTRICT DRAINAGE BOARD

Senior Assistant Electrical Engineer

APPLICATIONS are invited for the appointment of a Senior Assistant Electrical Engineer on the staff of the Engineer to the Board, Rookery Park, Erdington, Birmingham, 24. The salary will be in accordance with Grade IV (£1,025 × £50 × £1,175) of the A.P. & T. Division of the National Salary Scales.

Applicants must have a Degree in Electrical Engineering, or be Corporate Members of the Institution of Electrical Engineers, and must have experience in the preparation of plans, estimates and the installation and maintenance of modern industrial plant up to 3.3 kV. Previous experience with a local authority is not necessary.

HOUSING ACCOMMODATION AVAILABLE IF REQUIRED.

Applications, which must include date of birth, nationality, qualifications, appointments held and the names and addresses of two referees, must reach the undersigned not later than Monday, 1st September, 1958.

ARTHUR J. WRIGHT,
Clerk to the Board.
Clerk's Office,
Lombard House,
Great Charles Street,
Birmingham.
22nd July, 1958. 4307

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

SHIFT CHARGE ENGINEERS,
NORTH TEES "C" POWER STATION

APPLICATIONS are invited for the appointment of Shift Charge Engineers at North Tees "C" Power Station, Billingham.

The salary for these appointments (which are superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 7, Class J (£1,065-£1,140 per annum) plus a 10% allowance for shift work.

Forms of application may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne 1, to whom they should be returned to arrive not later than 11th August, 1958. 4325

SOUTHERN ELECTRICITY BOARD

SENIOR AUDIT ASSISTANT

Chief Accountant's Department, Southern Electricity House, Littlewick Green, Maidenhead, for duty in Internal Audit Section. Salary N.J.C. Grade 7 (£1,035-£1,125 per annum). N.J.C. conditions of service.

Applicants should be qualified accountants with experience of audit work with a professional accountant or of internal audit within the electricity supply industry or other large organisation. The successful applicant will be based upon the Board's headquarters at Maidenhead but will be required to operate throughout their area for the greater part of the year.

Applications on forms obtainable from the Secretary at the above address, and returned to him, quoting reference Z.933, not later than 11th August, 1958.

ASSISTANT ENGINEER (Planning)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.905, in envelopes suitably endorsed, not later than 11th August, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 4356

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited from suitably qualified ladies for the post of DEMONSTRATOR/HOUSECRAFT ADVISER in the Aberdeen Area of the North of Scotland Hydro-Electric Board. The Aberdeen Area of the Board covers the City of Aberdeen, Kincardineshire, and part of Aberdeenshire, including Deeside, but training of assistant demonstrators from other areas would form part of the duties of the successful candidate.

The successful candidate would be required to advise consumers of electricity and carry out demonstrations. There are, at present, two assistant demonstrators in the area.

Applicants should have

1. Suitable training and qualifications, including the E.A.W. Demonstrator's Certificate.
2. At least three years' experience in the demonstration of electric cookers and other appliances to the public.

Ability to drive a car would be an advantage.

The post is superannuable, and the salary would be in accordance with the National Joint Council Agreement, the range of salary being £615 × £20 to £675 per annum, placing being according to qualifications and experience.

Application forms obtainable from the undersigned, should be completed and returned not later than Monday, 11th August. Previous applicants for this post need not renew their applications.

J. E. WHITTAKER,
Area Manager.

Millburn Street,
Aberdeen. 4354

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

FOURTH ASSISTANT ENGINEER (Hendon District) (Ref. 798)

CANDIDATES should have had a sound technical training and some experience in the construction, operation and maintenance of underground distribution systems, including substations, at voltages up to 33 kV.

Salary N.J.B. Class G, Grade 11 (£740-£785) plus London allowance.

Apply by letter to R. F. Winder, M.I.E.E., Manager, Eastern Electricity Board, 137/139, Brent Street, Hendon, London, N.W.4, by 18th August, 1958. 4344

SOUTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER (Operation and Maintenance)

Exeter District

APPLICATIONS are invited from suitably qualified and experienced persons for the above appointment.

Salary according to Class E, Grade 7, £835 × £15 to £880 per annum of the N.J.B. Agreement.

Applicants should be thoroughly familiar with the operation and maintenance of urban and rural supply networks up to 33 kV, underground and overhead, including substation equipment, protective gear, fault localisation, maintenance of public lighting equipment and safety regulations. He must also be accustomed to the control of men and the systematic keeping of adequate records.

Graduate Membership of the Institution of Electrical Engineers or equivalent qualifications, and the ability to prepare plans and specifications for public lighting schemes would be an advantage.

Applications to be made on official form OBTAINABLE BY POSTCARD ONLY from District Manager, South Western Electricity Board, 3, Bedford Street, Exeter. Closing date for receipt of completed applications is 16th August, 1958. 4351

CENTRAL ELECTRICITY GENERATING BOARD

Engineers, Mechanical and Civil Engineering Section

APPLICATIONS are invited for the above appointments at the Research Laboratories, Leatherhead, Surrey. The successful candidates will be required to undertake theoretical and experimental studies concerning a variety of problems encountered in the generation and transmission of electricity, including thermal stresses in reactor shielding and steam piping. Candidates must possess initiative and be prepared to design and instrumentate their own test apparatus. A degree in engineering or its equivalent and preferably some industrial or research experience is required, although suitable applicants direct from university will be considered.

Salaries will be on scales within the following ranges: £550-£1,265 or £1,160-£1,735 p.a., according to qualifications and experience.

Applications, stating age, qualifications, experience, present position and salary, should be forwarded to I. G. Ellis, Personnel Officer, 24/30, Holborn, London, E.C.1, by 29th August. Please mark envelopes "Confidential," and quote ref. ER/217. 4350

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

THIRD ASSISTANT ENGINEER (Planning and Development).

Applications are invited for the above superannuable appointment from candidates who hold a Higher National Certificate in Electrical Engineering or its equivalent and have had a sound engineering training with experience in the design and layout of large distribution systems up to and including 33 kV.

The salary will be within Class J, Grade 10 of the N.J.B. Agreement (£885/£930) per annum.

Applications on the standard form obtainable from any Area Manager should be received by 15th August, 1958.

G. F. MOORE.
Area Manager.

Greenholm Street,
Kilmarnock. 4359

ELECTRICIANS

required for interesting work in connection with instrumentation in a large chemical works.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4247

EAST MIDLANDS ELECTRICITY BOARD

Coventry and District Sub-Area

GENERAL ASSISTANT COMMERCIAL ENGINEER

APPLICATIONS are invited for the post of General Assistant Commercial Engineer in the Sub-Area Commercial Department at Coventry.

Applicants should have received an engineering and commercial training and a good knowledge of the Board's tariffs, industrial and commercial development, negotiations in respect of new supplies and extensions to existing supplies is essential. Applicants should preferably possess the Higher National Certificate in Electrical Engineering.

The salary and conditions of appointment will be in accordance with the National Joint Board Agreement, Class K, Grade 14 (£740 × £15 to £785 per annum).

Applications stating age, qualifications and experience, previous and present appointments, should be forwarded to the Manager, Coventry and District Sub-Area, Sandy Lane, Coventry, so as to reach him within fourteen days of the issue of this advertisement. 4360

ELECTRICITY AUTHORITY OF CYPRUS

STATION SUPERINTENDENT required for two tours each of two years with prospects of permanency or in certain circumstances on temporary terms. Salary (including bonus and overseas and temporary allowances) £2,530 a year. Outfit and settling-in allowances £35 (£75 if accompanied by wife). Children's educational grants in certain circumstances. Free passages and furnished quarters. Liberal leave on full salary. Superannuation scheme similar to C.E.G.B. scheme. Benefits under latter scheme may sometimes be preserved.

Candidates must be Corporate Members of the Institutions of Electrical or Mechanical Engineers or equivalent. They should have had extensive experience of public electricity undertakings with particular respect to the operation and maintenance of steam-powered station plant and associated equipment, including 66-kV substations.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42690/EF. 4308

TRANSFORMER DESIGN ENGINEER

A SENIOR Transformer Design Engineer is required for a large modern transformer factory in Melbourne, Australia. Applicants must be technically qualified and have had considerable experience in the detailed design of both distribution transformers and power transformers up to 30,000-kVA capacity for voltages up to 132 kV. Recent actual experience in designing transformers using the latest techniques and materials to meet customers' requirements as to performance and tests is essential.

Free passages for successful applicant and family will be provided, together with assistance in obtaining a house.

Starting salary £A.2,000 per year. The company operates a contributory pension scheme.

Reply with full details of age and experience to the Secretary, A.E.I. Overseas Ltd., Crown House, Aldwych, London, W.C.2. 4343

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

APPLICATIONS are invited for a post as ASSISTANT GRADE B in Electrical Engineering. Duties will commence as soon as possible.

Candidates should preferably hold a degree in Electrical Engineering and/or Corporate Membership of the Institution of Electrical Engineers, and have practical experience in industry and in teaching. Salary scale £650 by £25 to £1,025 per annum with additions for qualifications and experience.

Further particulars and application form will be sent by the undersigned. Last date for receipt of applications 22nd August, 1958.

E. C. SMITH,
Principal.

July, 1958. 4353

Situations Vacant (continued)

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

A TECHNICAL EDITOR

is required in the Publicity Department at Trafford Park, Manchester. He should be interested in the clear and concise presentation of technical information. An ideal background would be a combination of engineering and writing.

The successful applicant will join the section responsible for the company's technical and commercial publications, which range from power station plant to scientific apparatus, and will work in close co-operation with the technical and commercial staff concerned.

Write giving details of age, education, training, experience, present position and salary to the Manager, Publicity Department, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, 17. 4361

REPRESENTATIVES

with experience of selling electric cookers and fires required for the following areas :—

(a) London.
(b) Eastern Counties.
(c) Merseyside and N. Wales.

Applicants should be not over 35, resident in the area, and possess a car.

A sound connection with the Area Electricity Boards, electrical wholesalers and retailers is essential.

Write giving age and details of education, qualifications and experience, to :—

BELLING & CO. LTD.
Bridge Works, Enfield, Middlesex
4326

A. E. R. E., HARWELL

Electrical Technicians

ELECTRICAL Technicians (with apprenticeship or equivalent training) are required to supervise staff commissioning and subsequently maintaining the Proton Linear Accelerator and to be responsible for its operational control. Knowledge of high-vacuum systems, electronic equipment, control circuits or light electrical engineering and O.N.C. (Elec.) desirable.

Salary scale £875-£1,050.

Housing and superannuation schemes, excellent conditions.

Send POSTCARD to the Group Recruitment Officer (1166/48), Atomic Energy Research Establishment, Didcot, Berks, for application forms and details. 4300

MINISTRY OF TRANSPORT AND CIVIL AVIATION

ELECTRICAL ENGINEERS (Assistant Signals Officers) for aviation telecommunications and electronic navigational aids. Min. age 23, 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E. or A.F.R.Ae.S. (candidates with Parts I, II and III of A.M.I.E.E. or Parts I and II of A.F.R.Ae.S. or equivalent, or of very high professional attainment without these qualifications considered.

Salary £665 (age 23) to £1,085 (age 34). Max. £1,250. Slightly lower outside London and for women. 5-day week.

Further details and forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.129/8A. 247

PIPE FITTERS

required for interesting work with prospects of training to become instrument fitters at a later date.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham
4248

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Corporate Membership of I.E.E. or I.Mech.E. an advantage.

MAINTENANCE ENGINEER
(Mechanical),
BARKING "C" POWER STATION
(Vacancy No. 58/558).

Wide experience in maintenance of modern generating plant. Duties will include organising and planning of overhauls of turbine and boiler plant and associated equipment. Character and ability to supervise staff is important. Salary Class J, Grade 6 = £1,210 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 11th August, 1958. 4313

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

GENERAL ASSISTANT ENGINEER
(Planning)

APPLICANTS should have knowledge of design, construction and operation of distribution systems. A knowledge of technical and economic factors in system layout and design will be an advantage.

Candidates should possess Higher National Certificate in Electrical Engineering or equivalent.

Salary N.J.B. Grade 12 (£685-£730). Superannuation scheme applicable.

Application forms, obtainable from the undersigned, should be returned by 14th August, 1958.

R. B. ANDERSON,
Area Manager.

Dudhope Crescent Road,
Dundee.
July, 1958. 4324

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area
Scunthorpe District

FOREMAN INSTALLATION INSPECTOR

APPLICATIONS for the above position are invited from suitable persons who have the necessary experience in the control and supervision of installation inspectors and meter fixers operating in Urban and Rural areas.

Candidates must have served a recognised apprenticeship and be fully conversant with the appropriate regulations dealing with electrical installations in industrial, commercial, farm and domestic premises.

Salary and conditions will be in accordance with the N.J.I.C. agreement, Schedule E, Grade 1, £715 per annum.

Applications giving full details of age, qualifications and experience, together with names of two referees, should be forwarded to the District Manager, Scunthorpe District, Yorkshire Electricity Board, 37, High Street, Scunthorpe, not later than 15th August, 1958. 4355

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

APPLICATIONS are invited for a post as LECTURER IN ELECTRICAL ENGINEERING. Duties will commence as soon as possible.

Candidates should preferably hold a good degree in Electrical Engineering and/or Corporate Membership of the Institution of Electrical Engineers, and have practical experience in industry and in teaching. Salary in accordance with the Burnham Technical Scale for Lecturers (£1,200 by £30 to £1,350).

Further particulars and application form will be sent by the undersigned. Last date for receipt of applications Friday, 22nd August, 1958.

E. C. SMITH,
Principal.
July, 1958. 4352

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

SHIFT CONTROL ENGINEER required at Plymouth "B" Power Station.

Superannuation scheme. Salary N.J.B. Class G, Grade 10, £790-£835, plus 10% shift allowance.

Candidates should possess good technical qualifications and should have had training and experience in the control and operation of steam generating plant and main switchgear in a modern power station.

Applications on form A.E.6/ACT obtainable from your place of employment or the Divisional Secretary, 26, Oakfield Road, Bristol 8, should be completed and returned by 12th August, 1958. 4346

NORTH EASTERN ELECTRICITY BOARD

Area Board Headquarters

APPLICATIONS are invited for the appointment of FOURTH ASSISTANT ENGINEER, Chief Engineer's Department, System Protection Sub-Section, with location at Sunderland. Applicants must possess H.N.C. in electrical engineering or equivalent qualification. Experience in the testing, commissioning and maintenance of H.V. protection equipment an advantage. Salary Schedule B, Grade 8, £710/£910. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4348

WELTON ROSSER LTD.
invite applications from
ELECTRICAL ENGINEERS

with at least 5 years' experience in testing power transformers up to highest kVA ratings. Must be qualified to supervise the Test Dept. of a modern factory manufacturing heavy electrical equipment in Canada. Experience in impulse tests an asset. Minimum age 35.

Excellent salary, pension scheme, extra benefits, free passage to Canada, etc.

Please write or phone for application form to:

WELTON ROSSER LTD.
Industrial Development Consultants
12, Duke Street, St. James's, London, S.W.1
(Tel. Whitehall 6640-6988) 4362

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the North Wirral District. Salary £885/£930 per annum (N.J.B. H.9).

Applicants should have had experience in overhead and underground distribution work and possess suitable technical qualifications.

Applications on forms obtainable from the Manager, No. 3 Sub-Area, Merseyside and North Wales Electricity Board, Newgate Street, Chester, must be forwarded not later than 6th August. 4347

AREA SALES MANAGER

required by leading manufacturers of electrical control gear. Successful applicant will have sound technical and commercial background and a proven record of technical selling ability.

This is a senior appointment and a car is provided.

Apply to Regional Manager, Dewhurst & Partner Ltd., Suffolk House, Suffolk Street, Birmingham, giving full details of age, experience, salary required, etc. 4241

ACCOUNTS clerk required by electrical contractors, London, S.W.1. Preferably with knowledge of trade and some book-keeping experience. Good opportunity for keen young man. Write giving experience and salary required.—Box 4229.

ARMATURE winder. Progressive firm requires for repair shop a winder having sound knowledge all types A.C. and D.C. work. This company has other activities and there are good prospects of advancement for skilled man with initiative and some administrative ability. Write to Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 224

CONSULTING engineers need senior and junior drawing office staff at their Croydon office. Varied electrical design work at home and overseas. Good conditions. Non-contributory pension scheme. Luncheon vouchers. Qualifications, experience and performance govern salaries. Apply — Barlow, Leslie & Coombes, 119/121, High Street, Croydon, or 5, Catherine Place, Westminster, London, S.W.1. 4318

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

DRAUGHTSMAN for A.C. motor control gear and switchgear. 5-day week, pension scheme. Write or call—Airedale Electrical Co. Ltd., Harrogate Road, Apperley Bridge, Bradford (Tel. Idle 686). 4310

DRAUGHTSMAN/designer, experienced in electrical space heating schemes, preferably with electrical knowledge. Applications, marked "Confidential," stating experience and salary required, to the Manager, Ekco Heating, E. K. Cole Ltd., 5, Vigo Street, London, W.1. 4306

ELECTRICAL contracting supervisor required. Estimating experience essential. Accommodation available. North West London area.—Box 4336.

ELECTRICAL contracts/sales engineer. Opportunity for young engineer with commercial outlook, minimum academic qualifications O.N.C., knowledge of meters and relays an advantage. Write in confidence giving full details, experience, age and salary, to—Secretary, Chamberlain & Hookham Limited, New Bartholomew Street, Birmingham, 5. 9421

ELECTRICAL draughtsman. The Stanton Ironworks Company Limited, near Nottingham, has a vacancy for an electrical draughtsman with experience in planning schemes for lighting and power distribution and preparation of wiring diagrams for motors, control gear, etc., as applied to heavy industrial practice. The post is pensionable. 5-day week. Holiday arrangements honoured. Write in confidence to the Staffing Officer, stating age, qualifications and experience. 4304

ELECTRICAL engineer required for consulting engineers' office. Senior to take charge of projects carrying out the design of lighting and power installations for all classes of buildings. Five-day week, spring and summer holidays, pension scheme and luncheon vouchers. Apply in writing stating age, experience and salary required to—J. Roger Preston & Partners, 15, North Audley Street, London, W.1. 4329

ELECTRICAL engineer required for interesting and varied work on preparation of tenders for switch and control boards, etc., from limited basic information. Plenty of scope for ingenuity and originality of approach on both commercial and technical aspects. Small composite works London area. Full details and salary, please, to—Box 4303.

ELECTRICAL engineer-surveyor for inspection of electrical plant. Must possess H.N.C. and have general practical experience. Resident London (preferably West). Salary £735 to £1,060, E.S.A. scale. Pension and other benefits. Apply Eng. Dept., General Assurance Corp. Ltd., 99, Aldwych, London, W.C.2. 4315

ELECTRICAL engineers and contractors require engineer experienced construction steel tower and wood pole overhead lines. Excellent prospects. Pension scheme. Write age and experience.—Box 4316.

ELECTRICAL installation designers/specification writers with practical experience of wiring in buildings of all types and fully conversant with I.E.E. regulations. H.N.C. minimum standard. Applicants must be capable of working on own initiative and dealing with correspondence. Superannuation scheme. Five-day week. Reply to—Box 4338, reference L.4, quoting details of age, experience and qualifications.

ELECTRICAL technical and sales representative required for London district. Experience with oil industry requirements essential. Thoroughly conversant with flameproof conduit systems, switchgear and control panels. Send full details of experience to—Box 4327.

ENGINEERS for overhead and underground distribution schemes required by electrical engineers and contractors. Excellent prospects. Pension scheme. Give age and experience.—Box 4317.

ENGINEER required for high voltage engineering work, age 22-27, with degree or H.N.C. and works training (electrical power equipment). Apply giving details of training and experience to the Assistant Secretary, The Micanite & Insulators Co. Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17. 4340

ENGINEERING organisation offers an engineer an opportunity in their sales department. The duties will be in connection with electrical equipment for the machine tool industry and will entail advice to customers, preparing of quotations, processing of orders and servicing. Knowledge of the design of machine tools would be required. Applications to—Box 4320.

ENGINEERS required for the erection of lattice tower and wood pole overhead transmission lines, willing to serve either at home or overseas. Applicants should have a technical background up to H.N.C. (Electrical) standard. Experience desirable but not essential. Pension fund. Write giving full particulars and quoting reference C/76/55 to—Personnel Officer (Staff), British Insulated Callender's Construction Company Limited, 30, Leicester Square, London, W.C.2. 175

INSURANCE company requires for Cork area an electrical and mechanical engineer surveyor. Pensionable position paying suitable salary (according to qualifications) with a car supplied. Applications in writing giving details of experience, qualifications and age to—Box 4335.

KEEN young draughtsman with machine shop training required for small production drawing office of company engaged in the manufacture of control gear equipment. Electromechanical experience desirable but not essential. Permanent and progressive position. 5-day week, pension scheme, canteen, etc. Apply giving full details of age and previous experience to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 278

LABORATORY technician reqd. at Paddington Technical College, Saltram Crescent, London, W.9, for electrical laboratories. Salary £335 at 20 rising to £490. Addl. increments for specfd. quals. to £577. Partics. and applicn. forms (retnble. within 14 days) from Secretary. (1426) 4334

MANAGER for small company manufacturing electrical control gear, N.W. area. Write stating experience and salary required.—Box 4221.

PHILBLACK Limited require a development engineer for their Carbon Black Works at Avonmouth. Applicants should hold a B.Sc. degree and the equivalent of a professional qualification. Whilst experience of the carbon black industry is not expected, experience of chemical or petroleum plants, electrical installations or instrumentation will be an advantage. The position will appeal to an able and alert man who is able to work on his own initiative and who is interested in going ahead with a young and growing company. The starting salary will not be less than £1,000. Contributory pension scheme. Apply to the Works Engineer, Philblack Limited, Avonmouth Docks Estate, Avonmouth, Bristol, stating experience, qualifications and age. 4245

ROYAL NAVAL SCIENTIFIC SERVICE requires senior scientific officers and scientific officers for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for physicists, electronic engineers and mathematicians in areas specified. The following particular vacancies also exist: mechanical engineer for work on gas turbine problems in the London area; mechanical engineer for work on design and development of u/w devices in Portland area; metallurgists for Rosyth and Poole; chemists (physical and inorganic) for Poole area, Baldock and London. Candidates must normally be natural-born British subjects of natural-born British parents, with at least first or second class honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age. Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between the ages of 21 and 32 to compete for established posts. Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 4257

REFRIGERATION engineer required for service in British West Africa. Applicants must be under age 35 and must have had experience of installation and servicing of bulk cold store equipment. A knowledge of air conditioning equipment would be an advantage. Commencing salary would be not less than £1,100 per annum. In addition there are family allowances, free furnished accommodation, free passages and medical attention in Africa. Tours of about 21 months each followed by substantial leave in U.K. on full pay. Pension fund. Apply to—Box 4301.

REPRESENTATIVES required by old-established electrical distributors. Existing connection an advantage, but intimate knowledge of electrical wholesaling of greater importance. Vacancy exists at Bristol branch, also London. State full details of experience, age, etc.—Box 4265.

SALES order clerk required. Senior post, well paid position offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4263

SENIOR cost accountant required by old-established electrical contractors to take charge of billing and costing department. First-class experience essential. Write stating age, experience and salary required to—Box ER.583, c/o 191, Gresham House, London, E.C.2. 4337

SENIOR engineers reqd. with a view to taking control of a group engaged in the design of precision regulated power supplies. Candidegree in electrical engineering together with dates should be in age range 30-40 and have a some industrial experience. Knowledge of Servo control using transistor and magnetic amplifier techniques as applied to regulated power equipment would be an advantage. The position will carry a substantial salary according to age and qualifications. Applicants are invited to send full details in confidence to the Staff Officer, Ref. 744/20, Siemens Edison Swan Ltd., Woolwich, London, S.E.18. 4167

SITE supervisors and plumber-jointers required for cable installation work throughout the country including North London. Apply—Box 4213.

STAFF required to maintain the electrical and mechanical services in large new office building now nearing completion in Grosvenor Place. Preference will be given to applicants with sound knowledge of ventilation, refrigeration, pumps and cinema equipment. Apply in writing to—Maintenance Manager, A.E.I. Ltd., 33, Grosvenor Place, London, S.W.1. 4239

STOREKEEPER required, must be experienced and fully conversant with electrical wholesale trade. Good wages and conditions, superannuation scheme, canteen and social club facilities. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4264

TECHNICAL assistant with sound knowledge in general electrical engineering, qualified at least to H.N.C. standard, required as technical sales engineer by agents for well-known Continental electrical engineering organisation. The work is of wide range and interesting. Applicants preferably should have knowledge of German but this is not essential, and they should be between 25 and 40 years of age. Write with full details of education and experience to—Box 4319.

TECHNICAL writer for telecommunications equipment required by important manufacturing company in S. London. Practical experience on multi-channel carrier systems desirable, plus ability to express engineering information clearly and concisely. Duties will include instruction of visiting engineers. Permanent staff position with good prospects. Apply in confidence with examples of previous work if possible to—Box 4328.

TRACTION engineer required by National Coal Board's H.Q. Production Department based at Stanhope Bretby, Nr. Burton-on-Trent. Good technical qualifications and ability to carry out responsible work on a wide variety of traction problems, both on the surface and underground, throughout the coalfields are required. Appointment (superannuable) according to qualifications and experience within range £1,250-£1,850. Write to Staff Dept. (X.1206), N.C.B., Hobart House, Grosvenor Place, London, S.W.1, for application form, which should be completed and returned by 13th August, 1958. 4339

***Situations Vacant** (continued)*

TECHNICAL assistant required for drafting of electrical regulations, codes of practice, etc. Graduate I.E.E. or corresponding qualification necessary, also experience in committee work and drafting of reports. Comm. salary £775-£850, depending upon age and qualifications. Progressive post. Pension scheme.—Box 4309.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A.M.I.E.E., 46, executive experience all aspects sales, contracts, design, development, liaison, publicity in switchgear, motor control, cables, overhead lines, etc., seeks responsible senior position.—Box 9430.

ELECTRICAL sales engineer, 32, A.M.I.E.I., A.M.I.B.E., A.M.A.S.E.E., seeks position as technical representative.—Box 9418.

ELECTRICIAN seeks overseas work; served number of contracts abroad.—Box 9423.

EXECUTIVE, extensive experience electrical wholesale industry, seeks responsible position London.—Box 9415.

MAINTENANCE electrician (42), C. and G. Cert., installation and maintenance all types A.C., D.C. motors up to 60 h.p. Take charge and work on own initiative. Radio knowledge. House essential, London area preferred.—Box 9436.

MAINTENANCE supervisor, wide industrial experience installation and maintenance, incl. diesel alternators, seeks change.—Box 9416.

YOUNG man, 32, A.M.A.S.E.E., manager contracting business, seeks position where practical knowledge and adaptability is of more value than business acumen and where opportunity of further study is available. Suggestions welcomed. All replies acknowledged.—Box 9430.

ARTICLES FOR SALE

T.W.W.

Large A.C. Motors
3-phase, 50 cycles

Maker	H.P.	Volts	R.P.M.
B.T.H.	1,820	3.3 kV	368
B.T.H.	1,800	400/440	368
MATHER & P.	350	400/440	720
METRO-VICK.	310	400/440	1,440
MATHER & P.	300	400/440	720
BRUSH	250	400/440	420
B.T.H.	250	400/440	480
MATHER & P.	200	400/440	960
BROOK	110	400/440	580
BROOK	110	400/440	960
CROM. PARK.	100	400/440	480

THOS. W. WARD LIMITED
Albion Works, Sheffield
(Phone 26311, ex. 347; Grams, "Forward")
376

MOTORS

Commutator Type Variable Speed A.C. Motors, Moving Brush Type, 3/50/400-440 volts

H.P.	Revs.	Maker.
90/30	680/227	B.T.H.
45/4.5	2400/250	B.T.H.
30/5	720/120	A.S.E.A.
30/6	1500/300	B.T.H.
20/10	1400/700	B.T.H.
16/1.35	1600/160	HOLMES REYROLLE
5	1200/600	METRO-VICK

THOMAS MITCHELL & SONS LTD.
Bolton
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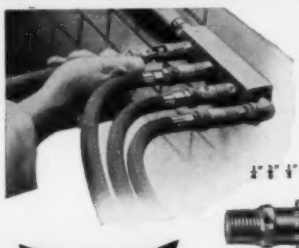

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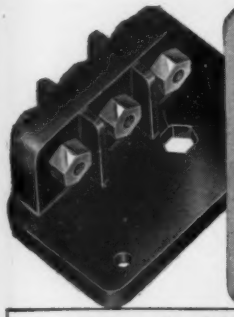

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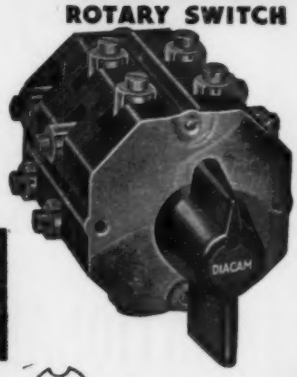

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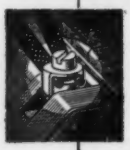

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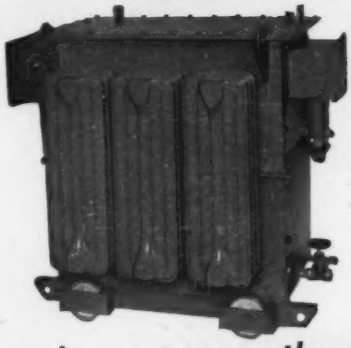

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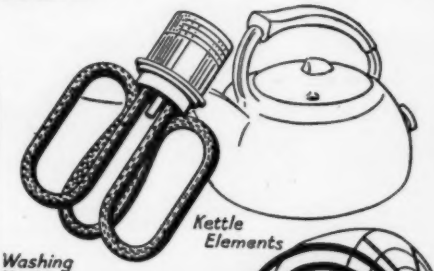

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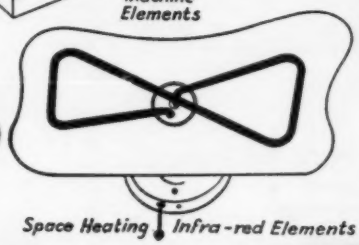

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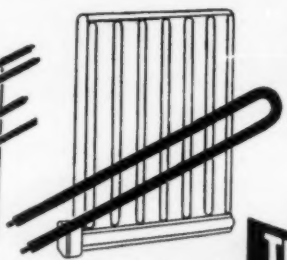

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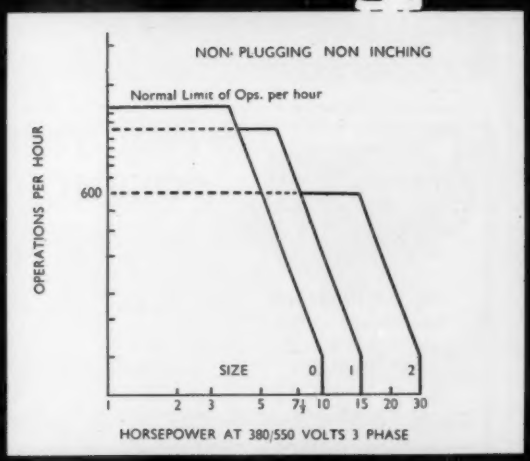

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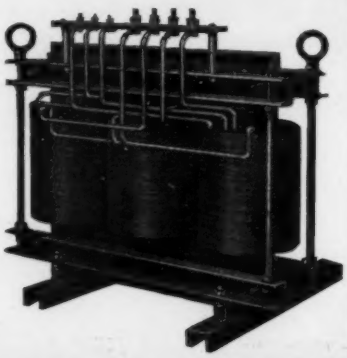

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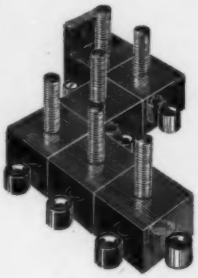

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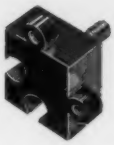

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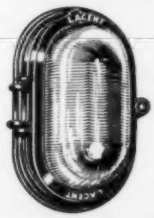

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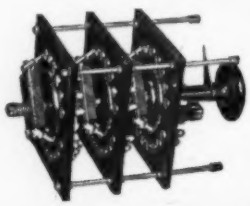

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